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Region**

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March 2012



Draft Environmental Impact Statement for the La Jara Mesa Mine Project

**Mt. Taylor Ranger District, Cibola
National Forest, Cibola County,
New Mexico**

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La Jara Mesa Mine Project
Draft Environmental Impact Statement
Cibola County, New Mexico

Lead Agency: Forest Service, U.S. Department of Agriculture

Cooperating Agencies: New Mexico Environment Department
New Mexico Groundwater Quality Bureau
Mining and Minerals Division, ENMRD
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Abstract: On April 15, 2008, Laramide Resources (USA) Inc. (the applicant), submitted a plan of operations (plan) for mining uranium at the La Jara Mesa mining claims. The proposed plan contains a general description of the major activities that could occur at the claims area. The plan includes development, operation, and mine reclamation for an overall time period of up to 20 years. The mining claims are located on National Forest System land (Mt. Taylor Ranger District, Cibola National Forest) northeast of the town of Grants in Cibola County, New Mexico (16.4 acres of northeast corner of Section 15, Township 12 North, Range 9 West, and 0.1 acre on Section 11, Township 12 North, Range 9 West). Disturbance on the 16.4 acres includes improvements to existing roads, construction of a new water pipeline and electric distribution line in the road right-of-way, and an escape raise/air vent at the top of La Jara Mesa, all of which are directly associated with the applicant's plan.

Reviewers should provide the Forest Service with their comments during the review period of the draft environmental impact statement (draft EIS). This will enable the Forest Service to analyze and respond to all of the comments and to use information acquired in the preparation of the final environmental impact statement (final EIS) for its decision. Reviewers have an obligation to structure their participation in the National Environmental Policy Act (NEPA) process so that it is meaningful and alerts the agency to the reviewers' position and contentions (Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553 [1978]). Environmental objections that could have been raised at the draft EIS stage may be waived if not raised until after completion of the final EIS (City of Angoon v. Hodel [9th Circuit, 1986] and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 [E.D. Wis. 1980]). Comments on the draft EIS should be specific and

should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

Send Comments to:

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Date Comments Must Be Received: Within 60 days after the date that the Environmental Protection Agency publishes the notice of availability of the draft EIS in the Federal Register.

Summary

Introduction

Laramide Resources (USA) Inc. (the applicant), has submitted a plan of operations (plan) for development of underground uranium mining and surface support facilities at the La Jara Mesa property at Mt. Taylor near Grants, New Mexico. This draft environmental impact statement (draft EIS) evaluates the potential environmental impacts of implementing the proposed plan.

Purpose and Need for the Proposed Action

The Federal action associated with the EIS is the Forest Service's decision on whether or not to approve the applicant's proposed plan, or decisions on which, if any, mitigation measures will be required to protect other non-mineral surface resources consistent with the forest plan, Federal regulations, and other applicable laws. The applicant has a right to develop and remove mineral resources as set forth by the General Mining Law of 1872 as amended. These laws provide that the public has a statutory right to conduct prospecting, exploration, and development activities (1872 Mining Law and 1897 Organic Act), provided they are reasonably incident (1955 Multiple Use Mining Act and case law) to mining and comply with other Federal laws.

The Forest Service has the responsibility to protect surface resources. Mining regulations state that "operations shall be conducted so as, where feasible, to minimize adverse environmental effects on National Forest System surface resources (36 CFR 228.8)" provided such regulation does not endanger or materially interfere with prospecting, mining, or processing operations or reasonably incidental uses (1955 Multiple Use Mining Act and case law).

Public Involvement

The notice of intent (NOI) to prepare a draft EIS for the proposed action was published in the Federal Register on May 14, 2009. The NOI asked for public comment on the proposal from May 14 until June 22, 2009. Two public open houses were held on May 20 and 21, 2009, in the communities of Grants and Gallup, Cibola and McKinley Counties, New Mexico, respectively. At the open houses, the Forest Service provided information on the proposed action and alternatives, offered opportunity for the public to talk to resource and planning specialists, and encouraged the public to submit comments on the scope of the EIS and on alternatives, to share issues and concerns, and to ask questions. In addition to the NOI and open houses, the initial scoping included online listing in the U.S. Forest Service Quarterly Schedule of proposed actions, letters sent to interested and affected individuals, agencies and organizations, and publication of legal notices. Comments submitted were summarized in a scoping summary report (Golder Associates Inc. 2009) and considered in determining the scope of this draft EIS.

As part of the public involvement process, the Forest Service set up a link on the Southwestern Region's Web site (http://www.fs.fed.us/nepa/nepa_project_exp.php?project=25654) to present information and documentation about the project to interested parties. This information is included in the "Cibola National Forest Schedule of Proposed Actions" (SOPA) report. As part of their responsibilities under Section 106 of the National Historic Preservation Act (NHPA), the Forest Service has ongoing consultation with tribes and solicited their input on the project. Using comments from the public, agencies, tribes, and other interested parties, the Forest Service developed a list of issues to address in this draft EIS as identified below.

Issues Identified During Scoping

The Forest Service separated the issues into two groups: significant and nonsignificant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Nonsignificant issues were identified as those: (1) outside the scope of the proposed action; (2) already decided by law, regulation, forest plan, or other higher level decision; (3) irrelevant to the decision to be made; or (4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) regulations explain this delineation in Sec. 1501.7, "...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)...."

The Forest Service identified the following significant issues for discussion in the EIS:

- Project effects on the characteristics that make the Mt. Taylor Traditional Cultural Property eligible for the National Register of Historic Places (NRHP).
- Need for reclamation and restoration of disturbed land.
- Potential contamination of ground and surface water, and how such contamination would be avoided.
- Potential impact of uranium mining on the local and state economy based on a statewide study of such impacts.
- Transport of uranium ore up to the state highway system, using other documentation for offsite transport issues. Ore processing analysis to include a discussion of transport to a possible uranium processing site, although the actual site of processing is unknown.
- Potential health and safety risk of uranium mining.
- Potential disturbance to wildlife in the vicinity of the mine and escape raise.
- Protection of recreational resources based on local uses near the site.
- Compliance with regulations and permitting requirements.
- Cumulative effects of uranium mining in the area and statewide.

Proposed Action and Alternatives

No Action Alternative

Under the no action alternative, the proposed La Jara Mesa Project (the project) and all associated infrastructure, including the surface facilities, water supply and pipeline, and access road improvements, would not be constructed. The no action alternative assumes that the site would remain undeveloped land, as currently managed by the Forest Service and adjacent private property owners. Recreational opportunities would still occur on the site and use of the roads by the public on the site would continue. Other site vicinity uses would include use and maintenance of Forest Service and private roads, grazing, hunting, 4-wheel drive vehicle use and electric transmission lines. Under the no action alternative, neither the impacts nor benefits of the project would occur.

Under the no action alternative, current Forest Service management plans would continue to guide management of the project area.

Proposed Action Alternative

The project that is being evaluated under the Forest Service's proposed action would involve two phases: underground development (phase 1) and mining production (phase 2). Planned activities and facilities include access development, exploration, mining, material storage, transport, and reclamation. Surface facilities and infrastructure would be constructed to support the two phases. They are summarized below.

Phase 1: Underground Development

Detailed underground development work would be conducted to better define the uranium deposit. This phase 1 activity would be conducted to characterize the extent and quality of the ore body. Upon completion of phase 1, the applicant would decide whether or not to proceed with the mine and full production.

During phase 1, the applicant would develop dual and parallel inclines (tunnels) for access. This would include drilling, blasting, and rock removal. Blasting would start at the surface of the opening and would be conducted deeper inside the mine as the tunnels proceed. Surface infrastructure would be constructed sufficient to support the underground development phase. Once underground in the designated mineralized zone, the applicant would undertake geological mapping, longhole drilling with gamma probing, test mining, and collection of bulk samples for metallurgical and mill compatibility studies.

The underground development would be approximately 700 feet below the top of the mesa overlying the inclines (tunnels), approximately 500 to 800 feet above the water table. No onsite mill or associated tailings facilities are planned for the project. The underground project activities would produce unmineralized (nonradioactive) waste rock during phase 1, that will be placed outside the mine mouth (adit) or in some cases, in completed parts of the mine (in voids left by mining), and will produce uranium-mineralized rock that would be collected for removal and offsite testing. This placement, and the facilities required to support both phases, would cover most of the 16.4 acres required for the project. If testing supports mine development, phase 2 would be implemented.

Phase 2: Underground Mine Production

If the applicant decides to proceed with mining after analysis of the ore samples, they would begin phase 2. Actual mining and tunneling would use an underground technique that is known as room and pillar mining. Targeted ore production would average approximately 500 tons per day, varying on grade and geometry of the deposit. This ore would be trucked out of the mine, deposited on a temporary holding pad, and picked up by truck for delivery to an offsite uranium processing mill. The mill that would be used to process this ore is not known at this time. One possible location being considered for processing is at an existing facility in Utah. This or other facilities may be operating at the time mining operations are underway.

Improvements to the local road system, including turn lanes, would be constructed where the site access road intersects with NM 605, to accommodate the anticipated 12 to 13 daily truckloads of ore hauled from the site. As with phase 1, there are no plans for onsite processing (milling) or mill tailings disposal. All uranium ore would be hauled offsite. Phase 2 also includes a permanent (life of mine) water supply pipeline, electrical transmission line, and support facilities as described in detail in chapter 2.

Reclamation

Upon completion of operation, the site would be reclaimed by implementing an agency approved reclamation plan. This reclamation would remove facilities, close the mine, and restore the site to a condition suitable for its existing uses. A summary of potential impacts is included in table 1.

Summary of Potential Impacts

Table 1. Summary of potential environmental impacts associated with the project

Resource	Impacts and Mitigation
Geology and Soils	Drilling, blasting to access mining areas; grading required to level portal access site with waste rock from phase I. Removal and onsite disposal of waste rock. Soil loss and covering minimized through soil storage, replacement, and reclamation including revegetation techniques after construction, operation, and reclamation. Removal of uranium ore.
Air Quality and Greenhouse Gases	Fugitive dust and temporary equipment emissions; application of water or synthetic dust control measures to control dust in roads and mine site. Emissions below major source permitting threshold levels. Project would be in compliance with all State and Federal air quality programs and plans. Project construction and operation would generate greenhouse gases (GHG). Use of uranium for power generation would displace older fossil fuel sources or meet new load without generating GHG.
Surface Water and Stormwater	Stormwater rechanneled around site and from parking and impervious surfaces. applicant will prepare and follow stormwater pollution prevention plan (SWPPP) consistent with stormwater National Pollutant Discharge Elimination System (NPDES) program requirements and water quality permit requirements of the New Mexico Environment Department (NMED) Water Quality Control Commission (WQCC) regulations. There are no streams on or near the site.
Groundwater	No water quality impacts to the groundwater table are anticipated. The facility will discharge sanitary wastes to shallow soils in a septic tank system. Stormwater and related runoff will be directed away from the site or, if in contact with ore, will be directed to lined evaporation ponds. Groundwater levels in immediate vicinity of wells will drop but no effects would occur to other wells.
Vegetation	A total of 16.4 acres of vegetation would be removed for the proposed facilities. Additional vegetation would be removed for road widening improvements. Some restoration will occur after construction of phase 1 facilities to reduce erosion, retain soils, and reduce dust; permanent restoration of the entire site will be implemented after closure. No impacts to threatened and endangered plant species anticipated. All disturbed areas would be reclaimed to meet agency requirements.
Wildlife	A total of 16.4 acres of potential habitat would be removed; local wildlife would be displaced to adjacent areas or would not survive if the carrying capacity of adjacent areas was exceeded. Potential impact to Gunnison's prairie dog: no decline in population expected. All disturbed areas would be restored to the extent possible.
Rangeland	A total of 16.4 acres of forage/grazing habitat would be removed; temporary noise impacts may deter cattle from the site area during the start of phase 1. All disturbed areas would be restored to the extent possible.
Energy and Natural Resources	Fuel consumed to operate vehicles and equipment; energy consumed to process ore at the selected mill. Permanent use and consumption of uranium ore.
Noise	Temporary noise from blasting until mine opening is deep enough to reduce blasting noise; total predicted noise impact at 1 mile from project site is below Housing and Urban Development (HUD) recommended goal for exterior noise level of 55 dBA (A-Weighted Decibels).

Resource	Impacts and Mitigation
Land Use and Recreation	Project is consistent with land use standards and regulations. Seasonal impact to hunters.
Visual Resources	Visual impact to users using forest roads near site. Site barely visible from nearest state highway.
Population and Housing	In-migration expected to be minimal or none. No impacts to population or housing.
Environmental Justice	No disproportionate impacts identified. Impacts to the traditional cultural property (TCP) potentially affecting tribes discussed in the “Heritage Resources” section of chapter 3.
Public Services and Utilities	No impacts identified; no increase in population expected. No impacts to public services or utilities such as police, fire, water, sewer, communications, or health services.
Economics	The construction, operational, and cumulative economic impacts to the State and county would include millions of dollars in tax revenue and would reduce unemployment. This is considered to be a positive potential impact of the project.
Heritage Resources and Traditional Cultural Property	Seven archaeological sites would be directly impacted; site testing will be conducted to determine National Register eligibility and/or the extent of the sites to determine site boundaries. Avoidance or potential data recovery provided for mitigation. Adverse effects to the Mt. Taylor TCP, a National Register eligible historic property.
Traffic and Transportation	Road improvements would be designed and constructed to New Mexico Department of Transportation (NMDOT) standards and requirements or to Forest Service requirements on National Forest System lands. Forest Service roads would be improved to 15 feet wide with slopes and 12 feet for drainage on each side. A site traffic study would be prepared for access permit. No impact would occur to level of service (LOS) on NM 605 and NM 122. The applicant is responsible for ongoing road maintenance for all non-State highways used for the project.
Human Health and Safety	Radon emission exposure at the escape raise opening and at the nearest residential property would meet health and safety standards for the public. New Mexico Legacy Health issues are described in the “Legacy Health Issues – New Mexico Uranium Mining” section of chapter 3. Uranium transport proposed to meet Federal standards. No impacts from radiation exposure are expected.

Decision Framework

The forest supervisor will use the EIS process to develop the necessary information to make an informed decision on whether or not to approve the proposed plan as submitted, or to decide what additional mitigation measures are needed to protect other resources as provided for in 36 CFR 228.8 (Code of Federal Regulations), table 2. The decision would ensure that the project conforms to provisions set forth in the existing 1985 “Cibola National Forest Land and Resource Management Plan” (LRMP).

Potential Permits and Approvals

Table 2. Potential permits and approvals

Federal	
Forest Service	Plan of Operations (plan) Special Use Permits (rights-of-way (ROWs), etc.)
U.S. Army Corps of Engineers	No evidence of wetlands or jurisdictional bed and bank features. Awaiting Corps determination of jurisdiction.
Environmental Protection Agency	Spill Prevention Control and Countermeasures Plan (SPCC) Notification of Hazardous Waste Activity Storm Water Pollution Prevention Plan (SWPPP) Subpart A of the Radionuclide National Emission Standards for Hazardous Air Pollutants (NESHAPs).
U.S. Fish and Wildlife Service	Threatened and Endangered Species (Section 7 Consultation)
Federal Communications Commission	Radio authorizations
U.S. Department of Transportation, 49 CFR	Requirements for transport and handling of radioactive materials including ore
Treasury Department (Bureau of Alcohol, Tobacco, Firearms and Explosives)	Explosives use permits
Mine Safety and Health Administration	Mine Identification Number Legal Identity Report Ground Control Plan Miner Training Plan Worker exposure standards
State	
Environmental Department Air Quality Bureau	Air Quality Operating Permit
Energy, Minerals and Natural Resources Department Mining and Minerals Division	New Mining Permit
Environmental Department Waste Management Bureau	Solid Waste System Permit
State Engineer	Permit to Appropriate Public Waters Dam Safety Drilling Permit
New Mexico Environment Department	Stormwater Permit Review
New Mexico Environment Department Groundwater Bureau	Discharge Permit
New Mexico Environment Department Drinking Water Bureau	Public water supply system
Environmental Department Radiation Control Bureau	Radiation Control License for Nuclear Density Gauge
Game and Fish Department	Wildlife Consultation
State Historic Preservation Office	Section 106 Consultation

Highway and Transportation Department	Access off NM 605
NMED Petroleum Storage Tank Bureau	Registration of diesel and petroleum tanks
Cibola County	
Building Department	Building Permits Septic System Approval

Acronyms and Abbreviations

AADT	annual average daily traffic
AMP	allotment management plan
AMSL	above mean sea level
AOI	annual operating instructions
Applicant	Laramide Resources (USA) Inc.
AQB	Air Quality Bureau
AUM	animal unit month
AQCR	Southwestern Mountains-Augustine Plains Intrastate Air Quality Control Region
ARPA	Archaeological Resources Protection Act
ANFO	ammonium nitrate and fuel oil
ATV	all terrain vehicle
BACT	best available control technology
BBS	breeding bird survey
BLM	Bureau of Land Management
BNSF	Burlington Northern Santa Fe
BP	before the present
BMP	best management practice
Bq	becueral
Bq/g	becueral per gram
Bq/s	becueral per second
CDEC	Continental Divide Electric Cooperative Inc.
CEMS	continuous emissions monitoring system
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHDB	Consolidated Highway Database
Ci	Curies
C/MVM	crashes per million vehicle miles
CNF	Cibola National Forest
CO	carbon monoxide

Summary

CO ₂	carbon dioxide
Curie	37 billion disintegrations per second
CWCS.....	(New Mexico) Comprehensive Wildlife Conservation Strategy
dB	decibel
dBA	A-weighted decibels
DOT.....	Department of Transportation
EIA	Energy Information Administration
EIS	environmental impact statement
EIR	environmental impact report
EMNRD.....	New Mexico Energy, Minerals and Natural Resources Department
EMT	emergency medical technician
EO	Executive Order
EPA.....	United States Environmental Protection Agency
FCAA	Federal Clean Air Act
FIP	Federal Implementation Plan
FS	Forest Service, United States Department of Agriculture
FUS.....	formally used sites
g	Gravity-An earthquake energy unit equal to the acceleration of gravity
GEIS	generic environmental impact statement
GHG	greenhouse gases
GIS	geographic information systems
gpd.....	gallons per day
gpm.....	gallons per minute
GWQB.....	Ground Water Quality Bureau
HAP	hazardous air pollutant
H ₂ S.....	hydrogen sulfide
H ₂ SO ₄	sulfuric acid
HDPE	high-density polyethylene
HUD	Housing and Urban Development
Hz	hertz
IBA	important bird area
IO.....	isolated occurrence
ISL.....	in-situ leach
kV	kilovolt
lbs	pounds
Leq.....	sound level equivalent
Ldn	nighttime weighted sound level
LLC	Limited Liability Corporation
LOS	level of service
LO _E	mean noise level

LRMP	land and resource management plan
MgCl.....	magnesium chloride
MIS	management indicator species
mg/l.....	milligram per liter
MMD	(New Mexico) Mining and Minerals Division
mph	miles per hour
MoS ₂	black molybdenum mineral
MSDS	material safety data sheets
MSHA	Mine Safety and Health Administration
MSGP	Multi-Sector General Permit
mrem.....	millirem
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFSR	National Forest Service Road
NHPA	National Historic Preservation Act
NHS	national highway system
NMDOT	New Mexico Department of Transportation
NMDGF.....	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
NMSU	New Mexico State University
NMOSE.....	New Mexico Office of the State Engineer
NMPM.....	New Mexico Prime Meridian
NOI.....	notice of intent
NO ₂	nitrogen dioxide
NO _x	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NRC.....	United States Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSPS	new source performance standards
O ₃	ozone
OHWM.....	ordinary high water mark
OSHA	Occupational Health and Safety Administration
pCi	pico Curie; one trillionth of a Curie
Pb.....	lead
PIF	Partners in Flight
PM	particulate matter
PSD.....	prevention of significant deterioration
PTOE.....	Professional Traffic Operations Engineer
RAP	remedial action program

Summary

rem.....	roentgen equivalent man
RO	reverse osmosis
ROG	reactive organic gas
ROW.....	right-of-way
SAP.....	sampling and analysis plan
SARA	Superfund Amendments and Reauthorization Act
SIP	State Implementation Plan
SGCN	species of greatest conservation need
SHPO.....	State Historic Preservation Office(r)
SIR.....	standardized incident ratio
SMACRA	Surface Mine Control and Reclamation Act
SMR	standardized mortality ratio
SO ₂	sulfur dioxide
SOPA	schedule of proposed actions
SPCC	spill prevention, control, and countermeasures
SPL	sound pressure level
SR.....	State Route
STA.....	site traffic analysis
SWPPP	stormwater pollution prevention plan
TAP.....	toxic air pollutant
TCP.....	traditional cultural property
TDS	total dissolved solids
TES.....	terrestrial ecosystem survey
TRS.....	total reduced sulfur
TSP	total suspended particulate
UMTRA.....	Uranium Mill Tailings Radiation Control Act
UNM.....	University of New Mexico
UNM-DGR.....	University Of New Mexico Division of Government Research
USDA	United States Department of Agriculture
USDOE.....	United States Department of Energy
USDOT.....	United States Department of Transportation
USGS.....	United States Geologic Survey
USFWS.....	United States Fish and Wildlife Service
VOC	volatile organic compound
VPD.....	vehicles per day
VQO	visual quality objective
WQCC.....	Water Quality Control Commission
WRAP	Western Regional Air Partnership

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Chapter 1. Purpose of and Need for Action

Document Structure

The Forest Service has prepared this draft environmental impact statement (DEIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This draft EIS discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized as follows:

Chapter 1. Purpose of and Need for Action: The chapter includes information on the history of the project proposal, the purpose of and need for the project, and the agency's needs and proposal for achieving that purpose and need. This chapter also details how the Forest Service informed the public of the proposal and how the public responded.

Chapter 2. Alternatives, Including the Proposed Action: This chapter provides a more detailed description of the applicant's proposed action and considers any alternative methods for achieving the stated purpose. No alternatives that meet the need for the proposed action were identified, so none were carried through the draft EIS. Alternatives that were considered but did not meet the need are discussed in chapter 2 and excluded from further consideration. Finally, this section provides a summary table of the environmental consequences associated with each alternative.

Chapter 3. Affected Environment and Environmental Consequences: This chapter describes the environmental effects of implementing the proposed action and no action alternatives. This analysis is organized by resource area.

Chapter 4. Consultation and Coordination: This chapter provides a list of preparers and agencies consulted during development of the draft EIS.

References

Appendix: The appendix consists of multiple parts and provides more detailed information to support the analyses presented in the draft EIS.

Index: The index provides page numbers by document topic.

Additional documentation, including more detailed analyses of project area resources, may be found in the project record located at the Mt. Taylor Ranger District office.

Background

Laramide Resources (USA) Inc. (the applicant), plans to develop and mine the La Jara Mesa property on U.S. Department of Agriculture (Forest Service) land north of Grants, New Mexico. The plan is to extract uranium ore for processing offsite. The applicant has submitted a plan of operations (plan) to the Forest Service for development of a uranium mine at the La Jara Mesa property. The La Jara Mesa Project (the project) is located approximately 10 miles northeast of the town of Grants in Cibola County (the county), New Mexico on the Mt. Taylor Ranger District of the Cibola National Forest (figure 1, "Site Location") on the southwest flank of Mt. Taylor. The applicant intends to accomplish this action through a two-phase integrated program consisting of Phase 1 – Underground Development and Phase 2 – Underground Mine Production.

Phase 1 includes the construction of support facilities and two adjacent tunnels into the base of La Jara Mesa to reach the ore. The opening of the tunnels is referred to as a portal. It includes the installation of temporary infrastructure facilities to support the phase 1 workforce. Phase 2 includes the mining of that ore and the construction of an emergency escape tunnel (raise) to meet mining safety regulations. Phase 2 also includes construction of permanent infrastructure to serve the mine and the phase 2 workforce.

Purpose and Need for Action

The Federal action associated with the EIS is the Forest Service's decision on whether or not to approve the applicant's proposed plan. The Forest Service need is to respond to the plan of operations submitted by the applicant, and to decide whether to approve it as submitted, or to require mitigation measures needed to protect other nonmineral surface resources consistent with the forest plan, Federal regulations, and other applicable laws. The applicant has the right to exercise their rights under U.S. mining laws to develop and remove the mineral resources as set forth by the General Mining Law of 1872, as amended. These laws provide that the public has a statutory right to conduct prospecting, exploration, development and production activities (1872 Mining Law and 1897 Organic Act), provided they are reasonably incident (1955 Multiple Use Mining Act and case law) to mining and comply with other Federal laws.

The Forest Service has the responsibility to protect surface resources. Mining regulations state that "operations shall be conducted so as, where feasible, to minimize adverse environmental effects on National Forest System surface resources (36 CFR 228.8)" provided such regulation does not endanger or materially interfere with prospecting, mining, or processing operations or reasonably incidental uses (1955 Multiple Use Mining Act and case law). Under 36 CFR 228.4(a) (Code of Federal Regulations) subsection (4), "If the district ranger determines that any operation is causing or will likely cause significant disturbance of surface resources, the district ranger shall notify the operator that the operator must submit a proposed plan of operations for approval and that the operations cannot be conducted until a plan of operations is approved."

Proposed Action

The proposed Federal action is to approve with required mitigations the plan of operations described as an underground uranium mine consisting of an approximately 16-acre surface area footprint. This footprint would be comprised of a waste rock storage area, temporary ore storage within the waste rock area, a new water line and electrical transmission line following the existing private and Forest Service roads to the site, and to the escape raise portal at the top of the mesa. The mine would include two adjacent and parallel adits (nearly level tunnels) that extend to the ore deposit where the active mine will be excavated. Both the mine and the adit are similar tunnels, but the terms refer to their function, as the adit tunnel provides access to the mine tunnel. When active mining is initiated, a vertical escape (raise) shaft will be bored to the top of the mesa to provide an escape route in the event of an accident in the mine requiring evacuation. It will also provide additional air circulation. The escape raise opening and supporting power and equipment will lie inside a fenced area of approximately 0.1 acre. Additional facilities at the mine include a locked explosive storage shed, lighting, ventilation fans, one or more stormwater ponds, water storage tank, shower and lunchroom facilities, and a field office.

The applicant purchased the rights to the uranium ore on the La Jara Mesa property in 2005 and controls unpatented¹ mining claims on lands administered by the Forest Service. The extent of these claims is shown on figure 1, “Site Location,” and reflects an underground claim area approximately 2 x 2.5 miles square. The applicant proposes to develop and conduct underground uranium mining operations as described in their plan. The proposed mining facility would be comprised of the portal (mine opening) and escape raise area, associated surface support facilities and infrastructure as described in chapter 2, access roads, and power and water supply. The operations footprint for waste rock and temporary ore storage outside of the portal is approximately 16 acres. The proposed Federal action is to approve the applicant’s plan of operations with mitigation needed to protect other resources consistent with forest plan, regulations, and other laws.

The mine portal facilities would be located on claims controlled by the applicant on National Forest System lands at the base of the La Jara Mesa at an elevation of 7,300 feet in the NE1/4, Section 15, T12N, R9W, New Mexico Prime Meridian (NMPM). The mineralized zones that would be accessed from the portal are located in portions of Sections 1, 2, 11, 12, 13, and 14, T12N, R9W, NMPM. The escape raise would be located on Forest Service administered lands on top of La Jara Mesa in Section 11, T12N, R9W, NMPM.

The applicant would conduct underground exploration investigations at the site and, if the exploration results and uranium production economics remain favorable, the applicant would transition from initial development work into full scale underground mining operation.

Phase 1 of the proposed action is referred to as underground development work. It is intended to attain four objectives:

1. Assess the geological and metallurgical characteristics of the uranium mineralized zones previously identified by surface drilling.
2. Confirm the economic value of the uranium mineralization.
3. Evaluate the technical and economic nature of future underground mining.
4. Clarify the offsite milling process and recoveries anticipated.

Phase 2 of the proposed action is referred to as the mining phase. Should it proceed, it would include the economic recovery of uranium resources from the mine to one or more mills for processing and potential sale to U.S. and world markets. It would also include construction of the facilities needed to support the mine operation workforce, such as water supply, power, and buildings as discussed in detail in chapter 2, under “Proposed Action.”

¹An unpatented mining claim is a particular parcel of Federal land, valuable for a specific mineral deposit or deposits, for which an individual has asserted a right of possession. The right is restricted to the extraction and development of a mineral deposit. The rights granted by a mining claim are valid against a challenge by the United States and other claimants only after the discovery of a valuable mineral deposit.

Decision Framework

The forest supervisor will use the EIS process to develop the necessary information to make an informed decision on whether or not to approve the proposed plan for the La Jara Mesa Project as submitted, or to decide what additional mitigation measures are needed to protect other resources as provided for in 36 CFR 228.8. The decision will ensure that the project conforms to provisions set forth in the existing 1985 “Cibola National Forest Land and Resource Management Plan” (LRMP) as amended.

Public Involvement

Public involvement activities for this EIS included public notices, public meetings, and meetings with members of local tribes. The notice of intent (NOI) to prepare an EIS for the project was published in the Federal Register on May 14, 2009. The NOI asked for public comment on the proposal from May 14 until June 22, 2009. Two public open houses were held on May 20 and 21, 2009, in the communities of Grants and Gallup, Cibola and McKinley Counties, New Mexico, respectively. At the open houses, the Forest Service provided information on the proposed action and alternatives, offered opportunity for the public to talk to resource and planning specialists, and encouraged the public to submit comments on the scope of the EIS and on alternatives, to share issues and concerns, and to ask questions. In addition to the NOI and open houses, the initial scoping included listing in the Quarterly Schedule of Proposed Actions on the Forest Service Web site, letters sent to interested and affected individuals, agencies, and organizations, and provision of legal notices. Comments submitted were summarized in a scoping summary report and considered in determining the scope of this EIS.

As part of the public involvement process, the Forest Service set up a Web page on the Cibola National Forest Web site to present information and documentation about the project to interested parties. As part of their responsibilities under Section 106 of the National Historic Preservation Act (NHPA), the Forest Service has initiated ongoing consultation with tribes and solicited their input on the project as well. Using the comments from the public, agencies, tribes, and other interested parties, the Forest Service developed a list of issues to address in this EIS as identified below.

Issues Identified During Scoping

The Forest Service separated the potential issues for consideration in this EIS into two groups: significant and nonsignificant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. The Forest Service defines nonsignificant in this context as an issue that is outside of the scope of this EIS, has been covered by prior environmental review, or is otherwise not relevant to the impacts and alternatives under consideration for this EIS. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7, “...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)....”

The Forest Service identified the following significant issues worthy of discussion in this EIS:

- Project effects on the characteristics of Mt. Taylor that make the Mt. Taylor Traditional Cultural Property eligible for the National Register of Historic Places.

- Need for reclamation and restoration of disturbed land.
- Potential contamination of ground and surface water, and how such contamination will be avoided.
- Potential impact of uranium mining on the local and state economy based on a statewide study of such impacts.
- Transport of uranium ore up to the state highway system, using existing information for farfield transport issues. This definition was modified during the EIS preparation process to include a discussion of transport to a possible uranium processing site, although the actual site of processing is unknown.
- Potential health and safety risk of uranium mining.
- Potential disturbance to wildlife in the vicinity of the mine and escape raise.
- Protection of recreational resources based on local uses near the site.
- Compliance with regulations and permitting requirements.
- Cumulative effects of uranium mining in the area and statewide.

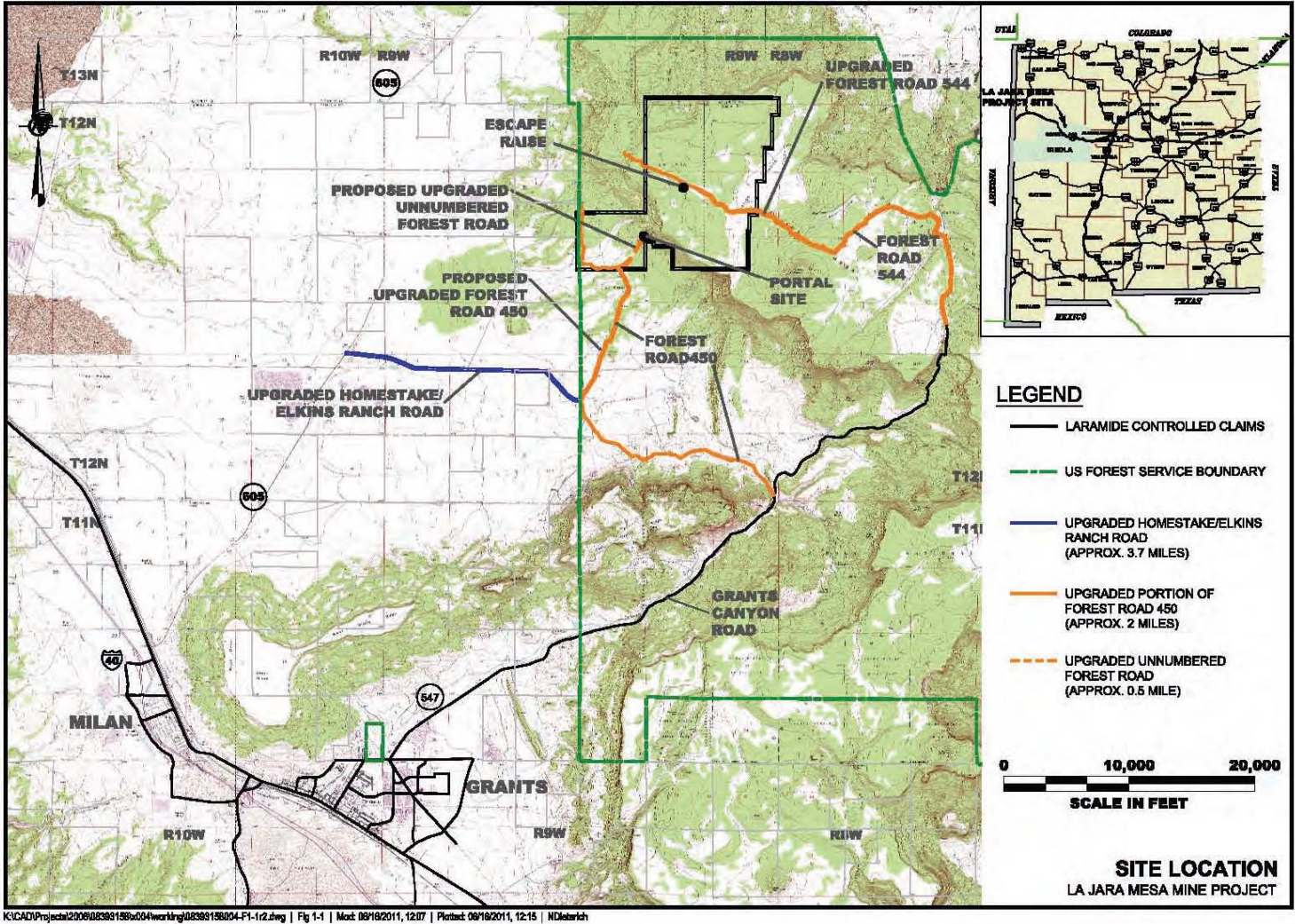


Figure 1. Site location

Chapter 2. Alternatives, Including the Proposed Action

Introduction

This chapter describes alternatives considered to meet the purpose and need for the project, including the proposed action and no action alternatives. Alternatives that were considered that did not meet the project purpose and need and were not brought forward for evaluation in the EIS are also discussed. The Federal action associated with the EIS is the Forest Service's decision on whether or not to approve Laramide Resources (USA) Inc.'s (the applicant) proposed plan of operations (plan) as submitted, or to require mitigation measures needed to protect other resources consistent with the forest plan, Federal regulations, and other applicable laws, as provided in 36 CFR 228.8.

The La Jara Mesa Project (the project) is located approximately 10 miles northeast of the town of Grants in Cibola County, New Mexico (figure 1, "Site Location"). The project is comprised of three distinct elements: (1) access roads and required infrastructure to support the mine; (2) the mine itself with its portal (opening) at the base of the mesa; and (3) the escape raise at the top of the mesa, the escape raise opening, to provide ventilation and provide an emergency escape route during mining operations.

Access to the site is via NM 605 east of the community of Milan. The site can also be accessed from State Highway 547 that traverses Grants Canyon (northeast of the community of Grants) and Forest Service Road 450 that connects with State Highway 547 near Lobo Creek.

The project includes a portal (mine opening) and support facilities at the base of La Jara Mesa and an escape raise from the mine to the top of the mesa that would be built if mining proceeds. The portal facilities would be located on claims controlled by the applicant on Forest Service administered lands at the base of La Jara Mesa at an elevation of 7,300 feet in the NE1/4, Section 15, T12N, R9W. The mineralized zones that would be accessed via the portal and tunnel (adit) to the mine are located in portions of Sections 1, 2, 11, 12, 13, and 14, T12N, R9W. The escape raise would be located on Forest Service administered lands on top of La Jara Mesa in Section 11, T12N, R9W at an elevation of approximately 8,100 feet.

Alternatives Considered in Detail

The Forest Service reviewed the comments received during the public scoping process to determine the issues of concern and any suggested alternatives related to the project. The Forest Service examined these comments to identify any appropriate alternatives to recommended courses of action which involves unresolved conflicts concerning alternative uses of available resources (NEPA, Section 102(2)(E) and Forest Service NEPA regulations at 36 CFR 220.5). Reasonable alternatives are those that meet the purpose and need for the proposed action, as described in chapter 1, and meet them with less environmental impact. Although the Forest Service identified several issues of concern related to uranium mining in their review of the plan and during the scoping process, none lent themselves to the identification of alternative ways to meet the purpose and need, as described in chapter 1. While no new action alternatives were identified during the scoping process, a no action alternative is included in the EIS as required by NEPA regulations.

No Action

Under the no action alternative, the project and all associated infrastructure, including the surface facilities, water supply and pipeline, and access road improvements would not be constructed. The no action alternative assumes that the site would remain undeveloped as currently managed by the Forest Service and applicable private property owners. Recreational opportunities would still occur on the site and current activities and facilities such as roads, grazing, and transmission lines next to the site would remain.

Under the no action alternative, current Forest Service management plans would continue to guide management of Forest Service roads and lands associated with this project.

Proposed Action

The proposed action is approval of the plan of operations for an underground uranium mine comprised of two phases: underground development and mining production. Phase 1, underground development, includes tunneling and rock sampling to determine the feasibility of the mine and to determine whether or not to proceed with mining, as well as development of a final mine design. Phase 2, mine operation, includes construction of permanent infrastructure facilities and mining activities associated with the ongoing operation of the mine as described below. Phase 2 implementation depends on the findings of phase 1. If phase 2 is initiated, it would likely start immediately after the completion of phase 1. The proposed action would require access development, exploration, facilities construction, mining of overburden and ore, material storage, transport, and reclamation. Surface facilities and separate infrastructure would be constructed to support the two phases, as described in more detail below.

Phase 1 Overview: Underground Development

Underground development work refers to the opening of a mine access point at the base of the mesa (portal), and the excavation of a pair of parallel and connected tunnels to the mineralized rock (adits) for the purposes of sampling, analysis, and potential mine design. It would be conducted to better define the uranium deposit, instead of conducting extensive surface drilling and its associated network of closely spaced drill hole pads and interconnecting roads from the top of the mesa. This phase 1 activity is being proposed to characterize the extent and quality of the ore body. Upon completion of phase 1, the applicant would decide whether or not to proceed with the mine and full production (phase 2).

During phase 1, the applicant would develop dual and parallel tunnels (adits) for access to the mineralized rock, approximately 5,000 feet into the mesa. Once underground in the designated mineralized zone, the applicant would undertake geological mapping, longhole drilling with gamma probing, test mining, and collection of bulk samples for metallurgical and mill compatibility studies. The underground development would be approximately 700 feet below the top of the mesa, approximately 500 to 800 feet above the water table, and would proceed approximately 5,000 feet into the mesa. No onsite mill, ore processing, or associated tailings facilities are planned for the project. Phase 1 would remove unmineralized (nonradioactive) waste rock from the mesa to get to the uranium mineralized material approximately 5,000 feet inside the mine. The mineralized material would be collected for removal and offsite testing. In development activities and mining operations, waste rock is synonymous to “nonmineralized” or ordinary rock with no ore or economic value that must be removed to gain access to “mineralized” or “ore” material.

Phase 2 Overview: Underground Mine Production

If the applicant decides to proceed with mining after analysis of the ore samples from phase 1 and the technical and economic nature of underground mining is determined, they would begin phase 2, mine operation and uranium ore recovery activities. This could happen immediately upon completion of the first phase in a seamless continuation. Phase 2 mining would use a room and pillar technique that involves excavation of underground rooms supported by pillars of untouched rock that hold up the ceiling. Targeted ore production would average approximately 500 tons per day, varying on grade and geometry of the deposit. This ore would be transported from the mine in diesel powered trucks. Mobile underground mining and support equipment will use diesel fuel. Some surface support vehicles (primarily nonhighway licensed) may use gasoline.

Ore removed from the mine would be deposited on a temporary holding pad on the waste rock storage pile approximately 400 feet by 800 feet in size, and loaded onto trucks for delivery to a uranium processing mill. The eventual mill site is unknown and will depend on the location of operating mills at the time. Improvements to the local road system, including turn lanes if necessary, would be constructed where the site access road intersects with NM 605 to accommodate commuting workers and the anticipated 12 to 13 daily truckloads of ore hauled from the site. There are no plans for onsite processing (milling) or mill tailings disposal. All uranium ore would be hauled offsite.

Construction Overview

The EIS evaluates the effects of construction and operation of the two phases. Construction would involve the following activities required to begin the project and initiate phase 1. Some additional construction would be required for phase 2 to install required infrastructure, as follows:

- Improvements to the intersection of NM 605 and the private dirt road accessing the Forest Service road.
- Installation of stormwater ditches along the dirt/access road.
- Diversion of runoff around the site.
- Clearing and blading approximately 6 miles of private and Forest Service road from NM 605 to the mine site to create a single lane road with turnouts for passing.
- Installation of temporary support facilities such as parking for phase 1 workers, portable chemical toilets, water storage, and other necessary temporary equipment.

Project Components

This section describes the primary components of the proposed action alternative in more detail. Information shown here is based on the applicant's plan of operations (Laramide Resources 2008). The entire project is described and reference is made to the project phase involved, where appropriate.

Surface Facilities and Infrastructure

The project would require surface infrastructure to support the underground development and mining (figure 2, "Site Plan"). Over the life of the project, 16.4 acres would be disturbed by the construction and operational activities (see table 3) associated with mine facilities, in addition to road access improvements—primarily using existing roads. This disturbance would be located on

unpatented mining claims located on Federal lands administered by the Forest Service. Concurrent reclamation would decrease the amount of disturbance after construction is complete.

Table 3. Surface area disturbance

Facility	Area (acres)
Portal area (ventilation fan and compressor)	0.8
Safety/shifter trailer with parking	0.4
Shop facility with laydown storage	3.1
Fuel storage area	0.4
Office and dry trailers with parking	2.7
Waste rock dump	5.4
Explosives storage area	0.5
Sewage treatment (septic tank with leach field)	0.5
Stormwater control structures (diversion ditch and basin)	1.5
Growth medium material stockpile	1.0
Escape raise surface area	0.1
Total	16.4

Ancillary and Support Facilities

Surface support facilities included in table 3 include administration, employee change facilities, a staffing and mine safety office, a shop, warehouse, storage area, and space for a lunch room and safety training. Trailers or modular buildings would be used as office space for project employees and contractor personnel, including management, engineering, safety, and environmental personnel. Project administrative offices would be housed in a double-wide trailer or modular building. Separate trailers would be used for the shifters' and safety manager offices. Mine safety and rescue equipment and gear would be stored in additional storage trailers. Trailers or modular buildings would be installed for use for the change facilities (dry) mentioned above. These facilities would provide lockers, lavatories, and showers. These facilities would be expanded to accommodate additional personnel during phase 2 of the mining operations.

The applicant would install a prefabricated fabric-covered "tent" structure to be used as a maintenance shop during phase 1. It would be approximately 40 feet wide and 70 feet long, with adjoining containers for warehouse storage for small parts and tool storage. A concrete pad would be poured to serve as a floor for the shop. Equipment parking and supply storage would be placed near the maintenance facility. Buildings and materials requiring containment will be placed on concrete slabs; other materials and parking will occur on gravel surfaces. As development transitions to mining, the applicant would expand the maintenance structure or install a more permanent maintenance building. Trailers and other buildings would be painted with nonreflective and earth tone paints to match local natural tones. All ancillary and support facilities would be located within the 16-acre project site.

Parking

During phase 1, parking would be provided for the 20 to 25 vehicles expected to transport workers to the site. If the project transitions from development to phase 2 mining operations, parking spaces would be created for 75 to 80 vehicles. Parking would be provided adjacent to the administration and shifter offices for employees, contractors, and visitors, and would be created by grading and clearing a site using crushed rock fill within the development footprint. No concrete or asphalt paving is anticipated, except as the maintenance shop foundation. A truck scale would also be located adjacent to the administration office.

Power Supply

Portable diesel generators would be utilized for the initial portal site and underground development work in phase 1. Continental Divide Electric Cooperative Inc. (CDEC) would supply electric service to the site in phase 2. Electric power would be supplied to the project site by construction of a new distribution line approximately 2.5 miles along the access road between the mine site to an existing CDEC transmission line that lies south of the proposed access road (figure 3, “Ancillary facilities and site access” and figure 4, “Proposed tie-in location for new transmission line”). Wood poles would be installed in the access road right-of-way (ROW) that are similar to existing poles currently on the property. They would be designed to meet raptor protection standards. An onsite transformer would reduce the transmission voltage for distribution to the underground workings, the maintenance shop, office and dry trailers, and other surface facilities. The applicant would maintain diesel generators onsite as backup to the electric power for times of interrupted or reduced power supply.

Communications

The applicant would contract with local utilities to install telephone and Internet communications to the site. Underground mine communications would be provided by phone lines from both the shifter and main administration offices to various points in the underground workings. Underground mine phones would be strategically located throughout the underground workings in conformance with the U.S. Department of Labor, Mine Safety and Health Administration (MSHA) standards.

First Aid and Safety Related Facilities

First aid supplies would be located strategically around the site, including offices and in the underground locations. A training room would be incorporated into the floor plans for the shifter or administrative office. The applicant would have the capability to conduct MSHA-required, new miner and refresher training onsite. Hospital and ambulance service is available in the city of Grants, approximately 10 miles from the site, in the event of a medical emergency.

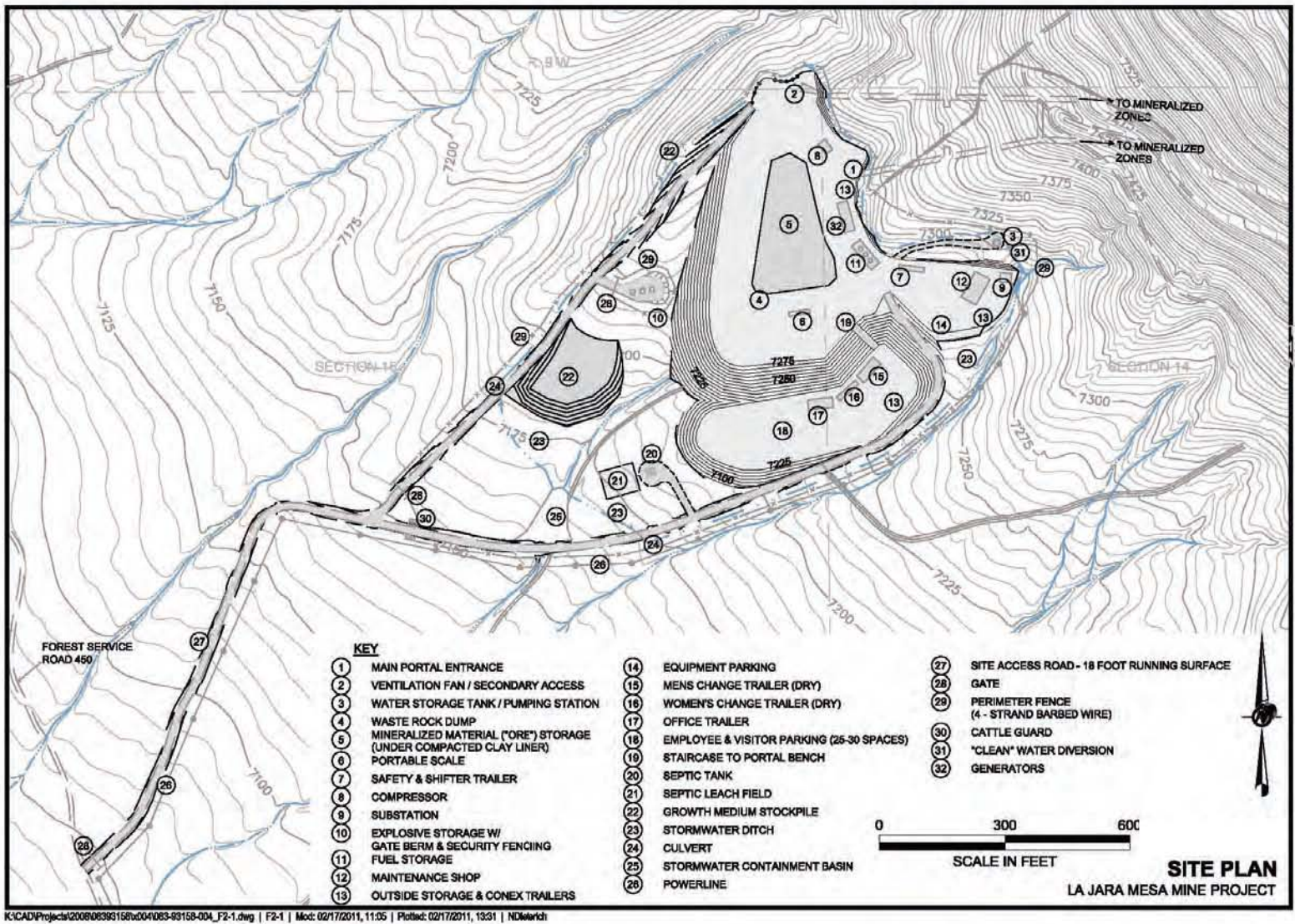


Figure 2. Site plan

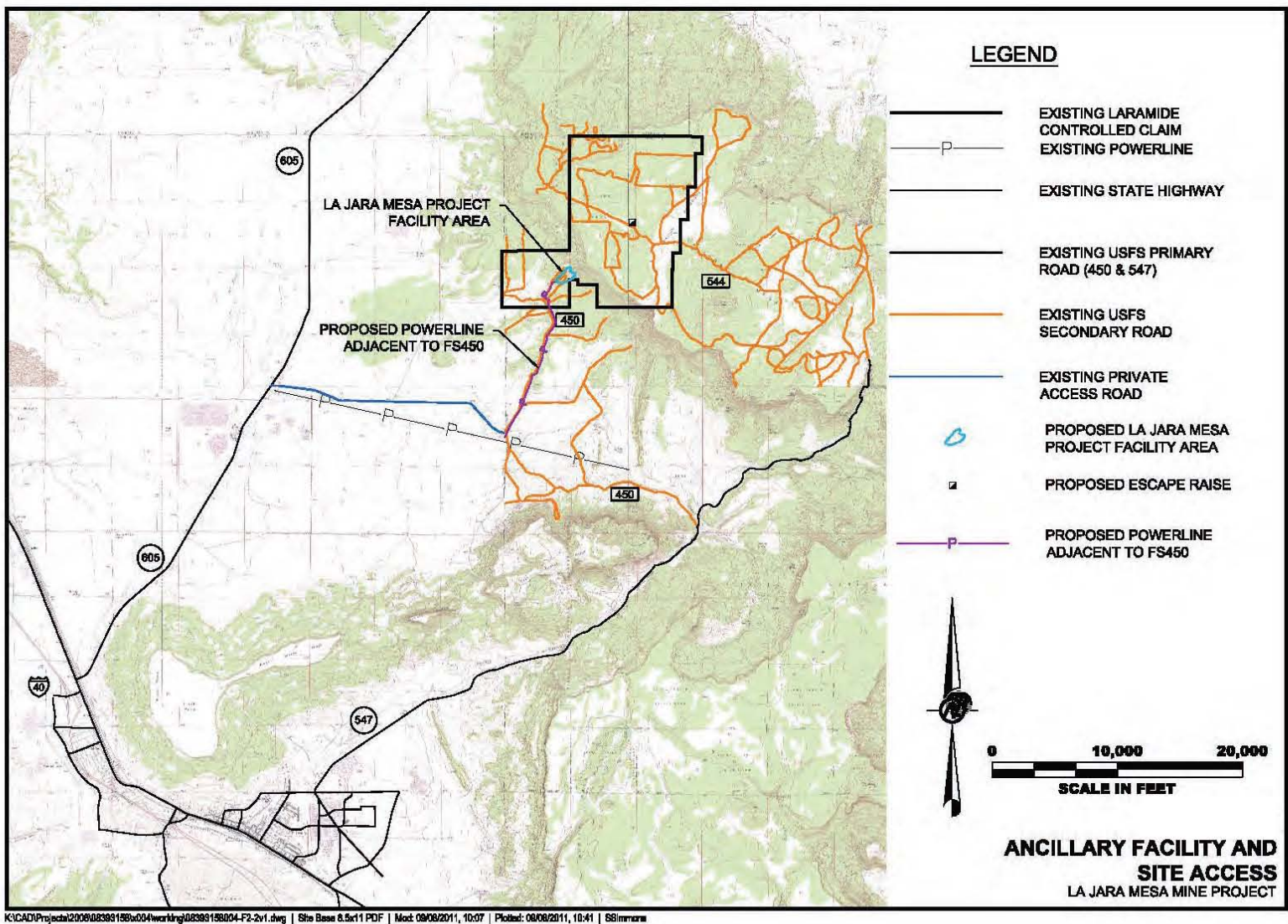


Figure 3. Ancillary facility and site access

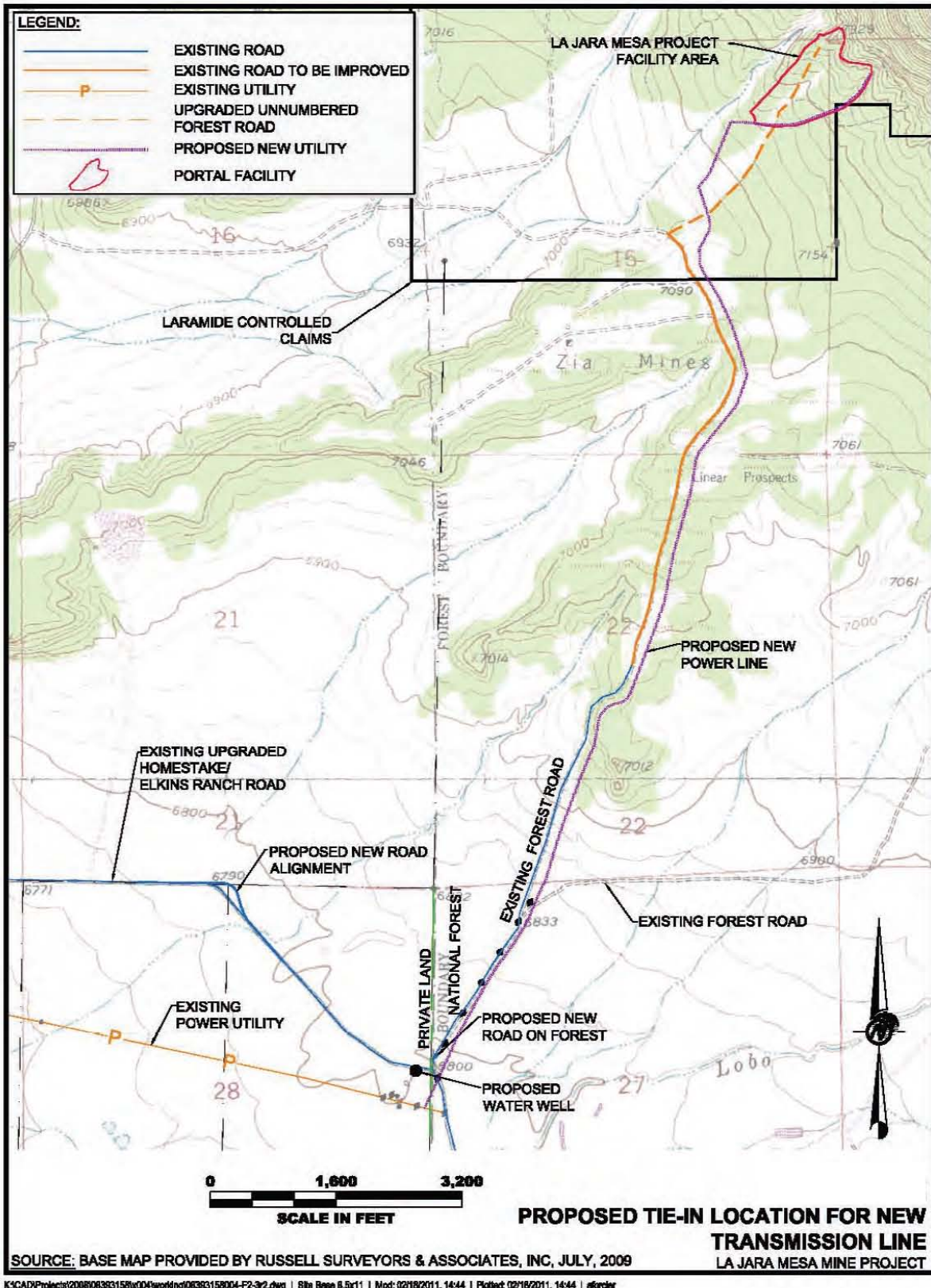


Figure 4. Proposed tie-in location for new transmission line

Ventilation Facilities

The applicant would install ventilation fans to ensure proper airflow to all spaces where underground contractors and employees would be working. The primary ventilation fan would be located at the surface portal facilities at the base of the mesa. To supplement the primary ventilation fan, smaller secondary booster fans would be placed underground, including a booster exhaust fan near the bottom of the escape raise in phase 2; these secondary fans would assist in directing ventilation to and from working areas. Ventilation fans would be sized to comply with MSHA ventilation requirements for air volumes (airflow) for underground uranium operations. Ventilation is needed to maintain fresh air for employees and to keep radon levels at accepted concentrations. Potential radon emissions are discussed in the “Health and Safety” section.

Compressor Facility

Air compressors would be installed near the portal to supply compressed air for certain underground equipment, such as drills. The compressor would be sheltered from the weather in a structure and enclosed with siding to reduce sound.

Water Supply and Distribution Facilities

The applicant will use an existing water well on the Elkins property for water supply and will purchase or lease the water. The well is currently used seasonally to provide water for cattle and is used intermittently. Additional water will be obtained from a new well on the Elkins property (adjacent to the access road) to provide water to the site from deeper aquifers such as the Chinle Formation or the deeper San Andreas-Glorietta aquifer. The applicant is negotiating easement agreements for these ROWs, along with approval for the well and pump station. A water pipeline would be built to convey water from the well site to the portal site and surface facilities. Water would be pumped to a storage tank to be located above the portal area via the pipeline that would be buried in, or immediately adjacent to, the site access road.

Two 10,000-gallon water tanks would be sited, one adjacent to the well on private land, and a second tank located at the surface portal facilities on Forest Service land. A third 10,000-gallon water storage tank may be added adjacent to the tank at the portal to allow for increased water storage capacity to accommodate additional personnel during mining operations. The tank at the well would also be used to support dust control efforts. The water from the tank at the portal would serve surface facilities (sinks, showers, lavatories) and would be used underground for drilling and dust suppression. The water used for human contact would be disinfected for potable use. Potable bottled water would also be brought into the site by commercial water suppliers for employees to supplement treated water onsite, if needed.

Water Use

Water would be used in administration and personnel buildings, underground operations, and for the control of surface dust. Projected water use requirements are presented in table 4.

Table 4. Projected water use requirements

Facility	Estimated Use Development Activities (gallons per minute)	Estimated Use Mine Production Operations (gallons per minute)
Underground operation (development and drilling)	5	10
Surface facilities – dry and office trailers	2	7
Surface dust control (seasonal basis)	15	15
Contingency ¹ (approximately 10 percent)	2	3
Total	24	35

¹ To accommodate seasonal variations and day-to-day fluctuations.

Water usage projections are based on current understanding of water requirements and would be modified and optimized based on operational experience. Underground usage would mainly be for dust control, removal of drill cuttings, and cooling drill bits. Estimated use for mining and dust control and potable uses for employees is approximately 34,500 gallons per day (gpd) during phase 1, development, and approximately 50,000 gpd during phase 2, mining.

Potable water (7 gallons per minute (gpm)) would also be needed for showers and sanitary use in the change facilities, as well as some water use in office trailers and the shop facility. Water usage in surface facilities is based on a rate of use of up to 100 gallons of water per person per day, assuming that 25 employees would be on the site on a daily basis during the development phase and up to 100 of the 110 personnel onsite over a 24-hour period during mining operations (not all at one time). This would generate a need for approximately 10,000 gallons of water per day for personnel during mining operations, or approximately 7 gpm. A sand filtration system would be employed at the site to remove sediment from the water. Water for human contact use (sinks, showers, and drinking) would be treated to meet drinking water standards, likely under NMED Drinking Water Bureau requirements. Treatment might include a disinfectant system (e.g., chlorine) and/or a reverse osmosis (RO) or equivalent treatment system.

Water usage for dust control is based on using a 3,000-gallon capacity water truck, applying a full water load each hour for 5 to 8 hours per day during the dry periods of the year. In addition, the applicant may use a water solution with magnesium chloride (MgCl) as a dust control suppressant to reduce dust from the access and haul roads. Other synthetic dust control suppressants are also available (e.g., SOILTAC, Soilworks LLC). Application rates for dust control suppressants vary, but in dryer climates, two or three applications are made per year, greatly reducing the use of water. A water truck is used to make these applications. Water would come from the proposed well(s) and storage tank(s). Total daily water use for the project would be approximately 60,000 gpd for all potable and non-potable uses and the annual use would stay the same over the life of the project.

Stormwater Management and Facilities

The applicant would install and maintain stormwater controls at the project site consistent with the U.S. Environmental Protection Agency's (EPA) stormwater management guidance and regulations. These controls would include diversion ditches, culverts, and stormwater collection

basins. Such controls would apply to access roads, phase 1 and phase 2 parking areas, buildings and other impervious surfaces.

Most runoff within the disturbed surface portal area would be directed toward a stormwater basin, where water would be allowed to evaporate or percolate into the ground or be used for site dust control. Runoff from the ore stockpile area would be routed to a separate stormwater basin where water would also be allowed to evaporate or be returned underground for dust control. Runoff from the ore stockpile area would not enter the offsite stormwater system.

The applicant would line both the ore stockpile and its stormwater pond with compacted clay to minimize infiltration. The applicant has stated in their proposal that the use of any synthetic (i.e., high-density polyethylene (HDPE)) liner for this purpose would be likely to result in ripping or tearing of the liner because placement and removal of stockpiled ore material is done with heavy equipment.

The applicant would prepare and submit a National Pollutant Discharge Elimination System (NPDES) Stormwater Pollution Prevention Plan (SWPPP) for the project for construction and operations per EPA requirements in New Mexico (40 CFR 122.26(b)(14)(i) – (xi), under Multi-Sector General Permit (MSGP-2000)).

Table 5 shows the design storm event frequency parameters that would be the basis for design capacity of the various stormwater facilities.

The mine itself is not expected to be a source of water. It lays hundreds of feet above the groundwater table and lays hundreds of feet below the surface of the mesa where most rainfall either evaporates, runs off, is used by local vegetation, or moistens soils and evaporates over time from shallow soils. Additional details on groundwater hydrology are discussed in this EIS.

Table 5. Frequency parameters for stormwater facilities

Facility	Measurement	Frequency Parameter
Stormwater ponds	Volume	100-year/24-hour (2.4 inches of precipitation)
Emergency spillway	Peak Flow	100-year/24-hour
Internal ditches	Peak Flow	25-year/6-hour (1.6 inches of precipitation)
Diversion ditches	Peak Flow	100-year/6-hour (2 inches of precipitation)
Culverts	Peak Flow	100-year/24-hour or 25-year/6-hour (24-inch-diameter culvert as a minimum size)

Sanitary Sewage Disposal Facilities

To support full mining operations (phase 2), the applicant would dispose of sanitary (nonindustrial) sewage waste through a septic tank and leach field system designed to meet Cibola County permit requirements. The State would review such discharge if it was expected to exceed the discharge volumes specified in State discharge requirements, which is likely. Appropriate percolation tests would be conducted by a qualified New Mexico licensed professional engineer and used to design the septic system. Portable chemical toilets, maintained by the contractor, would be used during initial construction and development work (in phase 1). Such sanitary waste would be transported offsite and disposed of by the contractor.

Solid Waste Disposal

Garbage would be contained onsite in bins and bearproof or bear resistant containers and hauled offsite for disposal at an approved landfill. Petroleum waste products would be stored in approved containers onsite, separate from other garbage products, and then transported offsite for recycling or disposal in an approved waste facility.

Fuel Storage

The applicant plans to use above-ground tanks for storage of gasoline, diesel fuel, and propane. The liquid fuel storage tanks would be of double-walled construction or placed in lined containment meeting NMED requirements. The estimated volumes of gasoline, diesel fuel, and propane to be stored at the project site would be as follows:

- Diesel fuel – 10,000 to 20,000 gallons
- Gasoline – 500 gallons
- Propane – 2,000 to 3,000 gallons

Diesel fuel would be delivered to the site on a periodic basis. Mobile underground mining and surface support equipment would use diesel fuel. The diesel storage tanks would be situated on a synthetically-lined (40- to 60-mil HDPE) floor and surrounded by a compacted soil containment berm. The berm would be designed to contain the full volume of the tanks with a 6-inch freeboard. Piping would extend from the diesel tanks to a fueling station adjacent to the tanks.

The gasoline storage tank would have full containment similar to the diesel storage tanks. Gasoline would be used to power certain mobile (primarily non-highway licensed) vehicles used solely at the operation site and for emergency use for company and contractor vehicles. These vehicles would typically be fueled offsite in Grants or other nearby towns.

Propane would be used to provide heat and hot water for the site facilities, including the change facilities. The diesel fuel, gasoline, and propane tanks would be located near the maintenance shop. The applicant would contract with local suppliers to deliver the required fuel.

Explosives Storage

Surface explosives magazines would be stored at a separate, remote, and fenced (locked) site, away from the main surface facility site. Explosive magazines would be sized and designed to meet the requirements of Title 27 CFR 181, Subpart J, Storage of Explosives. Underground explosives would be handled and stored in accordance with MSHA regulations for underground explosives storage. Explosives would be transported to the site by contract transporters approved by the U.S. Department of Transportation (USDOT).

Access Roads and Rights-of-Way

The proposed surface portal facilities would be accessible via Forest Service Road 450 from NM 605 via a private access road connecting the two. Currently, access to the site is via Forest Service Road 450 from the east, as shown in figure 3. The existing roadway would be used and maintained in its current location, although graded and improved as discussed below.

The applicant is currently negotiating ROWs for access to the mine site from the west (NM 605). Access from NM 605 would allow use of a gate and signage to restrict public access to the site. A

portion of the site access road would be located on private property, for which the applicant is negotiating easement agreements for ROWs. These ROWs on private land also would accommodate siting approval for a well and pump station. Existing Forest Service Road 544 would provide access to the proposed escape raise surface area.

Access to the project site would involve improvements to existing roads (figure 3, “Ancillary facilities and site access”). The portal area would be accessed by approximately 6.2 miles of existing roads, including approximately 3.7 miles of road across private property that has not been regularly maintained over the past 25 years. This road would be reestablished and graded. In addition, approximately 2 miles of Forest Service Road 450 from its junction with the aforementioned road across private property to the turn into the planned portal site would be improved. Final access to the surface facility area would require improvement of approximately 0.5 mile of an existing two-track unnamed Forest Service road.

The applicant would improve the existing roads to a single lane meeting Forest Service single lane road standards, 15-feet wide with 12 feet on each side for drainage that would also include construction of periodic (line-of-sight) turnouts, placement of appropriate subbase material and gravel, cattle guards, and new culverts. Total road surface and drainage width would be 39 feet. Improvements would be sufficient to accommodate highway legal trucks used to transport uranium ore from the site. No improvements are planned for Forest Service Road 544.

The applicant would meet New Mexico Department of Transportation (NMDOT) requirements for the intersection of the new access road with NM 605. The DOT would conduct a site threshold assessment for the point of access from the state highway. A “driveway access” permit is likely to be required at this intersection point. Access and egress turning lanes would be installed if required by NMDOT. If required, turning lanes would be designed and constructed to meet NMDOT standards. Road improvements on Forest Service property would be constructed to Forest Service standards for a single lane road.

The applicant would be responsible for ongoing road maintenance, including snow removal, to ensure safe and efficient year-round access to the surface portal facilities area. Snow removal blade type and removal procedures will ensure that the road itself is not damaged during snow removal.

With a projected production rate of approximately 500 tons of uranium ore per day and using 40-ton capacity highway trucks, it is estimated that 12 to 13 truckloads of ore material would be hauled from the site on an average daily basis. Trucks would be kept under the 40 ton gvw weight limits. Phase 1 commuter traffic is likely to be approximately 25 worker vehicles and phase 2 perhaps 100 vehicles. Additional detail on traffic assumptions is found in the “Transportation” section.

Security and Fencing

Three or four-strand barbed wire fencing would be installed along the perimeter of the portal area, depending on state and/or Federal requirements. A gate would be installed on the surface portal access road off Forest Service Road 450. This gate would be locked after normal business hours to prohibit unauthorized entrance. Management, including shift supervisors, would provide access for mine personnel after business hours. “No trespassing” signs would be posted at strategic locations to discourage unauthorized access. Access would be provided to the Forest Service for their land management purposes and as permitted by MSHA.

The explosives magazines would be secured in locked containers and kept separate from the main surface portal facilities. The explosive storage area would be enclosed by an 8-foot-high chain link security fence topped with angled barbed wire. The access gate would be locked at all times for security purposes.

The surface area for the escape raise would be enclosed by a 6-foot-high chain link security fence with angled barbed wire on top of the 6-foot fence. The access gate for this fence would also be locked at all times except to allow access for authorized employees.

Project Activities

This section describes the primary activities that would be conducted as part of the proposed action alternative.

Portal Face-up and Excavation

The opening of the portal and the incline access tunneled into the mesa to the uranium mineralized zone would be located in nonmineralized (nonore-bearing) sandstone rock. The initial portal openings at the surface would be established by conventional drill and blast methods advanced in short rounds, applicable to ground conditions. The rock would be supported as tunneling proceeds with a combination of rock bolts, wire mesh, and/or shotcrete (sprayed concrete or mortar mixture).

Typical drill and blast operations would include the use of a drill jumbo (underground drilling machine) to drill a series of small diameter horizontal holes in a pattern suitable to break the rock and minimize damage to the perimeter of the incline (tunnel) outline. The holes would be loaded and blasted with explosives. Removal of broken rock would be accomplished using diesel powered rubber-tired loaders.

During the initial portal excavation work, there is a potential for flying rock on the surface from blasting. Safety precautions applicable to surface blasting procedures would be followed such as loud warnings, assigned personnel stations, and rock blast restrictions. Once below ground, subsurface blasting procedures would be followed.

Blasting at the surface and just inside the portal is expected to last less than 1 week before subsurface blasting procedures would be followed. At this time, additional blasting and excavation would be done far enough inside the mine to minimize blasting noise heard outside of the mine.

Two portals would be established to allow parallel inclines into the uranium mineralized zones. The dual inclines would provide required levels of ventilation for underground mining operations. Maintaining parallel inclines into the mineralized zone would allow for proper ventilation underground and for secondary escape should a problem develop.

Incline Excavation

Incline excavation would be based on known geologic conditions and expected rock mechanics behavior of the sandstone into which the inclines would be driven. Two inclines would be constructed, each approximately 5,000 feet in length and between 50 and 75 feet apart. The inclines would be used for access to the mineralized zones by workers, equipment, and supplies

and for ventilation. The surface portal area would be located as shown on figure 2, “Site plan.” Rock removed during most of this construction would not be ore but would be nonradioactive sandstone or other rock type. Waste rock would be placed at the waste rock disposal site outside of the mine portal.

The following standard underground techniques would advance the inclines:

- Drilling
- Blasting
- Mucking (removal of the rock) and haulage
- Ground support (as necessary)

The drill jumbo would be utilized to drill a pattern of blast holes on the incline face. The cross-sectional size of the inclines would be 12-feet wide by 15-feet high. Drill holes in the incline would be 8- to 12-feet deep. Each 8- to 12-foot advance is known to miners as a “round.” Once the face has been drilled, the holes would be loaded with explosives and blasted. Blasting would be conducted when a round is loaded with explosives and the area is secured. Various types of explosives would be used, with charges being detonated by either fused or nonelectric initiation. Explosive handling and storage are discussed in “Explosives Storage,” above.

Muck bays are used to temporarily store waste rock underground before the material is removed to the surface. Although the term “muck” is used in the industry for such waste rock, and often refers to a wet muddy material, this material would be dry rock. Muck bays would be placed at 500-foot intervals along each incline, and each muck bay would be about 30-feet long. The broken rock would be loaded by underground front-end loaders onto trucks, which would deliver the rock material to the surface for construction of the surface pad.

It is expected that the loaders would have a bucket capacity of approximately 6 cubic yards, while the underground trucks would contain approximately 15 to 20 tons of rock material each. Any mechanical support necessary for rock stability would be installed prior to initiating the next round of drilling activities. At intervals of approximately every 500 feet, cross cuts would be driven between the two parallel inclines to provide proper ventilation and could be used as escape routes should a problem occur in one of the inclines.

Escape Raise Installation

To further enhance underground safety (i.e., both ventilation and secondary escape), the applicant would install an escape raise on the north side of the mineralized zone upon completion of the inclines at the completion of phase 1. The escape raise would be built as part of phase 2 and is a part of mining operations. The escape raise would be vertical, approximately 700 feet in length (from the underground workings to the surface) with a diameter of approximately 8 feet. This raise would be constructed utilizing a raise boring machine. A small diameter drill hole would be drilled from the surface to the selected area underground. Once established, a drilling raise bore would be “pulled” back to the surface, allowing all excavation to occur underground within the mine and underground rock to fall into the underground workings. From there it would be removed, hauled to the portal, and placed in the waste rock dump.

Waste rock volumes in place and after disposal estimates are shown in table 6. There would be sufficient room in the surface waste rock stockpile for rock material excavated from the raise. The volume of the escape raise waste rock is estimated at 1,300 bank yards of material.

The dimensions of the surface area to be used for escape raise facilities on top of the mesa would be approximately 50 by 100 feet, or approximately 0.1 acre. The sole facility at the surface site of the escape raise would be a 10 by 20 foot “generator shed” that would house a diesel generator for emergency electric power for the escape hoist (figure 5, “Raise layout”). This small structure would be constructed of wood and would be painted with a Forest Service approved color to blend with the surrounding forest landscape. It would be surrounded by a security fence.

The generator would be inspected and maintained regularly and would be available in the event of an emergency to power the escape pod as the “life boat” for miner evacuation.

Access to the escape raise collar site would be via an existing road (Forest Service Road 544) (figure 3, “Ancillary facilities and site access”). In the event of an emergency during the winter, the existing forest road may need to be plowed to remove snow and gain access to the escape raise site. The applicant would plan on frequent and regular visits to the site to ensure that the generator is in good working order. During these periodic safety inspection visits, when snow conditions prevent access by pick-up truck, personnel would use all-terrain vehicles (ATVs) or snowmobiles to access the site.

Table 6. Estimated volumes of waste rock

Feature	Dimensions	Volume (ft3)	Volume (yd3)
Inclines	2 x (5000' x 12' x 15')	1,800,000	66,700
Crosscuts (between inclines)	10 x (75' x 12' x 15')	135,000	5,000
Muck bays (along inclines)	20 x (30' x 12' x 15')	108,000	4,000
Development laterals and production area access	12,000' x 12' x 15'	2,160,000	80,000
Drill hole stations	100 x (30' x 12' x 15')	540,000	20,000
Escape raise	700' x 3.14 x (4' x 4')	35,200	1,300
Subtotal		4,778,200	177,000 ¹
Added volume at swell factor @ 20 percent		955,640	35,400
Subtotal		5,733,800	212,400 ²
Overbreak contingency @ 25 percent ³		1,433,500	53,100
Total		7,167,300	265,500 ⁴

¹ This volume is known as “bank cubic yards,” the in-place volume before it is blasted and removed from the underground mine. A 20 percent swell or bulking factor is assumed for the rock material.

² Once blasted and removed, volume is referred to as “loose cubic yards.”

³ Over-break is common in underground operations. Also, a general contingency to account for the level of current detail is merited. Assume 25 percent to account for these factors.

⁴ Assume 270,000 yd3 to report to the surface waste rock stockpile.

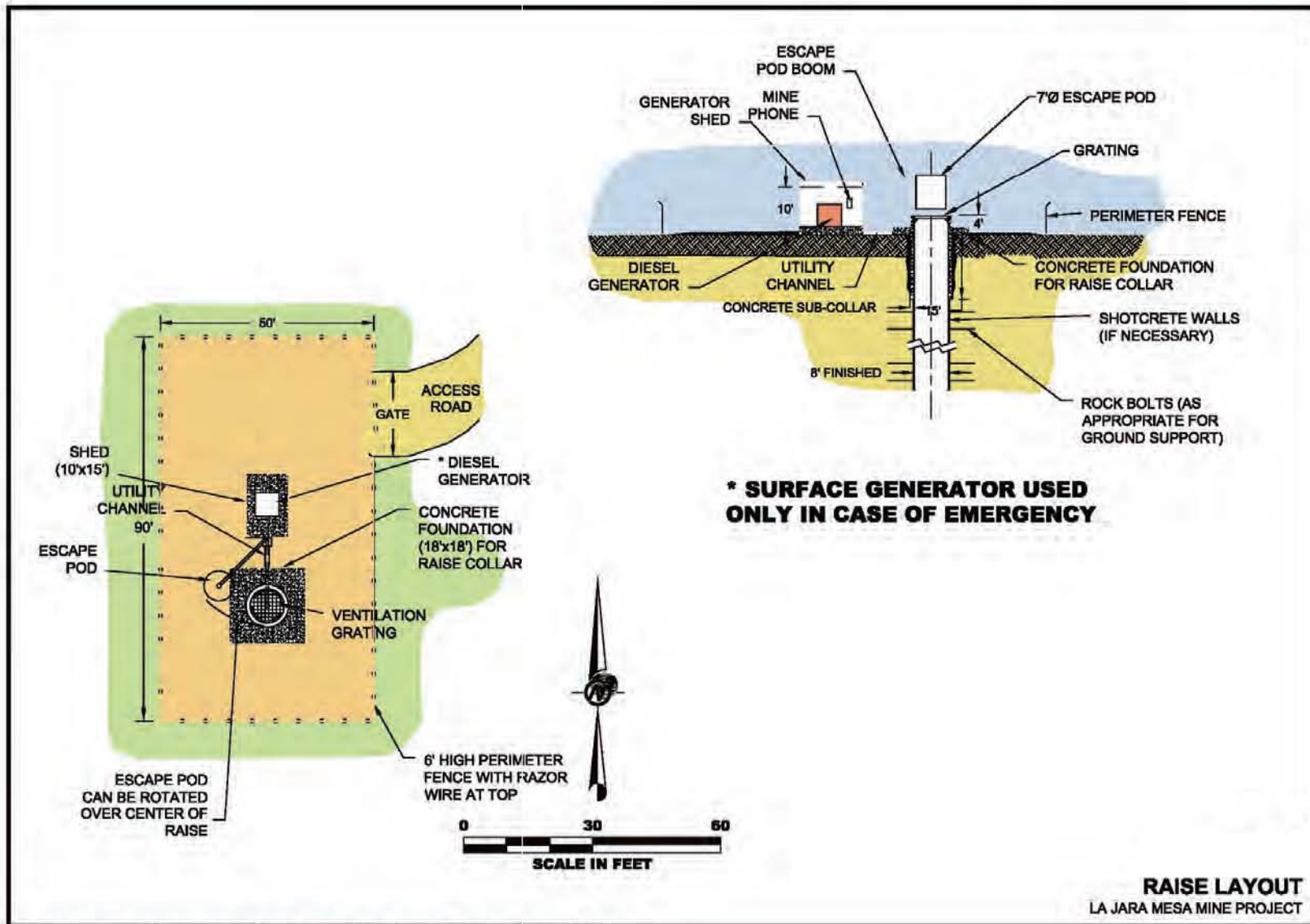


Figure 5. Raise layout

Material Extraction

The planned mining at the project site would involve an underground technique known as room and pillar mining. Targeted ore production would average approximately 500 tons per day. Actual ore production would vary depending on the grade and geometry of the deposit. Based on preliminary resource projections, mining can be conducted at the project for an estimated 6 to 8 years; however, underground exploration and development activities would continue at the site with a goal to identify additional ore reserves and a total operation of 20 years is also possible.

Ore material would be transported to the surface in trucks and placed on the clay-lined pad. Mined out areas would be backfilled with waste rock material inside the mine to minimize the amount of waste rock hauled to the surface.

Throughout mine production, development drifts would be constructed beneath the ore zones with ramps driven upward from these drifts to access ore zones. By utilizing this technique of mining, the applicant would be able to extract ore, backfill these mined out areas with waste rock, and then seal the mined out areas from the main flow of ventilation, thus being able to provide targeted ventilation to the areas being mined.

Waste Rock Handling and Storage

In development activities and mining operations, waste rock is synonymous to “nonmineralized” and “valueless” rock that must be removed to gain access to “mineralized” or “ore” material. Waste rock is distinct from the uranium mineralized material. During phase 1 development work, waste rock would be transported to the surface for use in constructing the portal facility pad area as shown on figure 2, “Site plan.” The pad area would be used for surface facilities and for temporary storage of bulk samples removed as part of the underground development program. The waste rock stockpile, also shown on figure 2, “Site plan,” has been designed to contain approximately 270,000 cubic yards of material as presented in table 6 above.

During mining, certain amounts of waste rock handled during production would be placed or backfilled directly into mined out areas. This backfilling would limit the amount of waste rock hauled to the surface from the underground workings. However, given the swell factor or “bulking” factor of the underground rock when broken by blasting, it is not possible to completely backfill waste rock back into the underground workings. The applicant has estimated that approximately 66,700 bank cubic yards of waste rock will be excavated from the inclines, and approximately 1,300 additional yards will be excavated from the escape raise. Total volumes would be greater due to the bulking factor. A total of 270,000 yards of rock is estimated to be disposed of in the surface rock stockpiles.

The applicant does not plan to backfill waste rock in the main underground inclines. The future reentry of an adit precludes backfilling of primary accesses into a resource zone should new discoveries or market changes warrant it. However, at permanent closure, the portals would be sealed and the area reclaimed. Following permanent cessation of operations, the applicant would regrade the surface waste rock dump to establish 3H:1V final slopes and drainage. The final graded surface facility pad would be revegetated as needed to blend into the surrounding natural landscape. See further discussion of reclamation activities below.

Underground Exploration

One of the principal objectives of the underground development work would be to collect information about the uranium mineralization from gamma probes that are inserted into longhole drill holes. Underground drilling would be conducted from drill stations located in laterals beneath the expected mineralized zones. The program would be comprised of between 75 and 100 individual underground drill holes/stations located along the development laterals. These are also used as temporary muck stations. Drill stations would be about 30-feet long. The holes would be drilled at various angles and drilled to lengths ranging from 250 to 500 feet. None of the drill holes would breach the topographic surface above.

The applicant would use two drill rigs for the underground longhole drilling. Each rig would be supplied with compressed air, fresh or recycled water, drain line, and electricity. It is anticipated that underground drilling would be performed on two 10-hour shifts per day, following a 10-day on, 4-day off schedule. Drilling is expected to begin shortly after reaching the first drill station, with drilling through the project life.

A drilling contractor would provide the underground drilling equipment and personnel. Holes would be drilled using water for drill hole lubrication and conditioning as necessary. Any used oils, trash, or other residue of the drilling operation would be disposed of in a permitted offsite facility.

Selected cuttings would be removed from underground for geologic logging and laboratory studies. This would include mineralized zone petrography, metallurgical studies, environmental testing, and assaying.

Bulk Sample Program

Bulk samples of mineralized uranium material for testing and study would be collected from cross cuts and laterals into the mineralized zone and moved to the surface. It is estimated that approximately 40,000 to 50,000 tons of uranium mineralized material would be removed for bulk sample testing. This sample size is required to gain an accurate portrayal of milling at an existing mill. Part of this work would be to analyze potential mining methods for future mining. Other work would include surveying, geologic mapping, chip sampling, and geotechnical studies.

The bulk sample would be placed on the surface on a compacted clay liner on the waste rock dump and trucked offsite on a regular basis for metallurgical and milling testing.

Project Equipment and Materials

This section describes the primary equipment, materials, and supplies that would be required as part of the proposed action.

Mobile Equipment

The project would use the same or similar equipment during mining production as used for the underground development work. Some equipment would be added or replaced during the life of the mine as the older equipment reaches its useful life. Equipment may be modified during the mine life depending on site specific conditions and needs.

Table 7 provides the major pieces of mobile equipment to be used at the project site.

Table 7. Mobile equipment

Underground	Surface
Loader – 6 cubic yard capacity	Backhoe
Truck – 15-20 ton capacity	Dozer*
Drill jumbos	Motor grader*
Grader	Fork lift
Personnel tractor	Front-end loader (7-8 cubic yard capacity)
Rock bolter	Water truck*
Jackleg drill (hand-held pneumatic drill)	40-ton ore haul trucks
Longhole drills	Supply truck (flatbed truck)
Portable substations	Light vehicles (pickups)
Fork lift	*Contracted and used on an as-needed basis.
Flatbed truck	
Lube truck	
Powder truck	

Materials and Supplies

Various consumable materials, primarily fuel and explosives, would be used during operations. Table 8 lists the major consumables that would be used.

Table 8. Materials and supplies

Material/ Supply	Daily Use (Approx.)	Monthly Use (Approx.)	Delivered Form	Amount Stored (Max.)	Storage Method
Diesel fuel	500-1,000 gals	15-25,000 gals	Liquid	10-20,000 gals	Tanks
Gasoline	20-30 gals	600 gals	Liquid	500 gals	Tanks
Propane	100-200 gals	3-5,000 gals	Gas	2-3,000 gals	Tanks
Oil/lubricants	20-50 gals	500-1,500 gals	Liquid	1,000 gals	Sealed Drums
Antifreeze	2-5 gals (variable)	50-100 gals	Liquid	100 gals	Individual Containers
Solvents	2-5 gals	50-100 gals	Liquid	100 gals	Individual Containers
Explosives (emulsion product)	500 lbs	15,000 lbs	Solid	15,000 lbs	Locked Magazines
Explosives (blasting detonators)	100-150	3,000-4,500	Solid	5,000 ea	Locked Magazines

Transport, handling, and storage for these consumables are as follows:

Diesel fuel – Diesel fuel would be delivered to the site via tanker truck and transferred to aboveground storage tanks, which would be placed in secondary containment.

Gasoline – Gasoline would be delivered to the site via tanker truck and transferred to aboveground storage tanks, which would be placed in secondary containment. Certain mobile equipment would use gasoline; many light and supply vehicles would be primarily fueled offsite, unless there is an emergency.

Propane – Propane would be delivered by a vendor and stored in certified tanks located near the surface facilities. Propane would be used to heat water for showers at the change facilities and to heat the facilities.

Oils/lubricants – Various oils/lubricants needed for equipment maintenance would be delivered by vendors and stored in approved containers located within or directly adjacent to the temporary maintenance shop facility. All used petroleum products and solvents would be collected in approved containers, transported offsite, and disposed of through qualified vendors.

Antifreeze – Antifreeze (50/50 premix) required for use in equipment would be delivered by vendors in approved containers that would be stored within or directly adjacent to the temporary maintenance shop facility. Used antifreeze would be collected in approved containers, transported offsite and disposed of through qualified vendors.

Solvents – Various solvents needed for parts cleaning would be delivered by vendors and stored in approved safety cabinets and storage containers within or directly adjacent to the maintenance shop where they would be used. The applicant would maintain appropriate spill kits (with sorbent pads) and granular absorbents onsite in the event of a solvent spill.

Explosives – Explosives would be delivered to the site by vendors and stored in secured and approved magazines. The applicant expects to use bagged ammonium nitrate and fuel oil (ANFO) or an emulsion product, along with detonating cord, cast primers, and blasting caps. Transportation, handling, storage, and use of explosives are regulated by the U.S. Department of Transportation, the U.S. Treasury Department's Bureau of Alcohol, Tobacco & Firearms, and MSHA.

No chemicals subject to the Superfund Amendments and Reauthorization Act (SARA) Title III in amounts greater than 10,000 pounds would be used at the project site. No hazardous substances as defined in 40 CFR 355 above threshold planning quantities would be used. The project would meet all conditions set forth for a "conditionally exempt small quantity generator for hazardous wastes," which is defined as any project generating less than 220 pounds of hazardous wastes per month. On average, the project would generate less than 100 pounds per month of hazardous wastes (spent oil, solvents, antifreeze, etc.). As stated above, these substances would be hauled from the site by a qualified contractor and disposed of in an approved disposal facility. The applicant would maintain material safety data sheets (MSDSs) for chemicals stored onsite.

Project Schedule, Workforce, and Costs

This section describes the project schedule, workforce requirements and reclamation costs associated with the proposed action alternative.

Schedule

The applicant plans to initiate construction of the surface facilities for the project immediately upon receipt of all permits and approvals. Initial site construction and surface facility installation work is estimated to take 2 to 3 months. Underground development work (phase 1) is estimated to take up to 2 years, with full mine production (phase 2) occurring during the following 16 to 18 years, assuming additional resources are found. Final project closure (sealing portals and escape raise) and reclamation work would require approximately 2 to 3 months of activity to complete.

Mine production is estimated to continue for up to 20 years. This estimate is based on current knowledge of the La Jara Mesa Project uranium resource requiring 6 to 8 years to mine, the forecast for the future uranium market, and the potential identification of additional economic resources at the site. Factors such as estimate of mineable reserves, mining rates, market conditions, revenues, costs, expected returns to shareholders and investors, and the associated economic, technical, regulatory, and political risks facing the uranium mining business all contribute to the eventual operation and longevity of the project.

Workforce

Workforce requirements for the underground development activities of the project could reach approximately 60 employees, although not all onsite at the same time; 25 of these would be staffing the day shift. At full mine production, workforce requirements are projected to be approximately 110 employees. Not all would be onsite at the same time because of shifts and other scheduled time off. Approximately 42 of these are expected to work the day shift. A rotating crew schedule would be employed, accommodating two crews per day, 10 hours per shift, 7 days per week. The day shift would generally occur between the hours of 7 a.m. and 5 p.m., and the swing shift would cover the hours from 5 p.m. to 3 a.m. Preventive maintenance mechanics would work a 10-hour shift that would span the 4-hour downtime not covered by a rotating crew. Required personnel includes management, office and technical staff, supervisors, hourly staff, and longhole underground drillers.

Project Reclamation

Reclamation of the project area includes both construction reclamation and final reclamation. Reclamation efforts on lands disturbed during the course of site development would include activities such as growth medium clearing, stockpiling onsite, and stabilization that are a prelude to final reclamation. In addition, stormwater and sediment control structures (such as diversion ditches and sediment traps/detention basins) would be constructed to minimize the potential for erosion and sediment loading during operations, reducing future reclamation needs.

Final reclamation activities would be implemented upon cessation of underground development and mining activities, if such commercial production is commenced. The areas to undergo final reclamation upon project closure would include the mine portals, the escape raise, surface facility areas, and the site access road (that are not needed for long-term land use purposes). The post-

project land use would be for wildlife use, roads, grazing, transmission lines, and recreation; the same uses that currently exist at the site.

Construction and Early Development Reclamation

Growth medium (suitable soils) would be cleared from areas to be affected by the project surface facilities during clearing and construction. The material would be stockpiled for final reclamation. Stockpiled growth medium material would be stabilized and protected from wind and water to avoid any erosion, and reseeded during the first normal planting season following development of the growth medium stockpile, the stockpile would be seeded with the seed mixture presented in table 9 below.

Table 9. Seed mixture

Species	Pounds of Pure Live Seed Per Acre
Western wheatgrass	8
Prairie junegrass	3
Sideoats grama	5
Sand dropseed	1
Arizona fescue	4
Total	21

The applicant would maintain a construction stormwater management plan for the project site consistent with state stormwater NPDES requirements and the SWPPP developed for the site. Drainage from undisturbed areas would be routed around the surface facilities. Stormwater on the site would be controlled by proper grading, ditching, dugout basins, and silt fencing.

Undesirable invasive and noxious weeds can colonize and overrun disturbed areas, both in the short and long term. Necessary control measures including hand pulling, hand digging, and biological control would be used to prevent and restrict the spread of noxious weeds. Certified noxious weed-free mulch and seed mixtures would be used to reclaim disturbed areas and control the spread of invasive and noxious weeds.

Final Reclamation

Upon permanent cessation of mining operations at the project site, the applicant would implement the reclamation efforts described below. Following permanent closure of the operation, salvageable equipment, instrumentation and furniture would be removed from the site. This activity would occur prior to actual removal of structures and facilities.

Decommissioning and Removal of Onsite Structures and Facilities

Project site structures and other facilities would be demolished and/or dismantled and removed from the site at the time of permanent closure. This would include office and maintenance structures, compressor facility, water and fuel storage tanks, power line, and other temporary trailers, ancillary, and storage facilities.

Salvageable equipment and trailers would be moved to another project, sold, or properly disposed of offsite. Unsalvageable portions of any facilities, such as a concrete pad used at the temporary maintenance shop, would be broken up and buried onsite if deemed suitable for disposal by the Forest Service. The chain link security fencing around the explosives storage area would be dismantled and removed from the site once the explosives and storage magazines are removed. The applicant would comply with the appropriate solid waste regulations administered in the state of New Mexico. The Forest Service would be consulted for approval of any concrete foundation disposal proposed on National Forest System lands.

Portal and Escape Raise Closure and Sealing

The project site portals would be closed and sealed similar to the detail shown on figure 6, “Portal and raise closure.” A concrete, cemented cinder block or similar constructed bulkhead would be installed inside each portal. Each incline would be backfilled with waste rock material, extending from the portal bulkhead to outside the actual portal.

A reinforced concrete slab would be placed over the borehole on firm bedrock and would be anchored into solid bedrock. This concrete would be constructed for permanence and to sustain the expected weight of the rock material that would be placed on top of the structure. Approximately 4 to 5 feet of rock material would be used to cover the concrete slab structure. An additional 10 to 15 percent volume of material would be placed to allow for possible future settlement. This rock material would then be graded to provide for drainage away from the backfilled opening. Growth medium/material (estimated at 6 inches) would be spread on top of the rock fill, and the site would be seeded with the mixture presented in table 9 above.

The barbed wire fence installed around the perimeter of the surface portal area would remain in place for 3 years after site closure to ensure that revegetation is successful. It would be maintained annually. This fencing would preclude any unwanted livestock or other large mammal grazing or at the site. Unless there is some long-term benefit for this site fencing, the fencing would be removed in the 3rd year after site closure. The chain link security fencing around the escape raise would be removed once the raise is closed and reclaimed and upon approval by the Forest Service.

Alternative Escape Raise Closure Elevation – To further reduce impacts to topography, vegetation, visual resources, recreation, and cultural values, an alternative to complete the raise closure at the exact level of surrounding land could be considered as mitigation. This would involve excavating into the ground around the raise but backfilling to the existing elevation level, rather than filling on top of the closed raise and creating an elevated fill pad. This option would be less visible, but might increase the likelihood of increased water infiltration into the closed shaft. This option is not proposed at this time.

Recontouring and Regrading of Disturbed Surface Area

Areas disturbed by project activities would be contoured and graded as necessary to blend into the surrounding topography and terrain (figure 7, “Post project topography”). Final slopes from the portal pad area would be graded to a 3H:1V slope. Compacted areas such as roads and the top of the portal pad would be ripped or disked to create a roughened condition prior to growth medium material replacement.

Growth Medium Replacement

Depths for growth medium (near surface and subsurface soil) salvage in the project area range from 0 to 12 inches. Where there are isolated pockets of thicker growth medium material within the area proposed for portal and escape raise facilities, such material would be salvaged to ensure an adequate source of growth medium material for reclamation. For reclamation purposes, it is assumed that there would be sufficient growth material available for salvage and replacement on the final regraded areas. Additional growth medium may be brought in from offsite if needed, subject to approval by the Forest Service.

Fertilizing, Mulching, and Seeding

Chemical and physical changes can occur in stockpiled growth medium material. Following its replacement, growth medium samples would be analyzed for pH, nitrogen, phosphorus, and potassium to determine its fertility and nutrient status. Approximately one sample per acre would be taken to determine growth medium fertility. For present planning purposes, it is assumed that an inorganic fertilizer (12 percent nitrogen, 15 percent phosphorous, 14 percent potassium) would be applied to the reapplied growth medium material. A fertilizer rate of approximately 200 pounds per acre would be used; this application rate would be revised, as appropriate, after the growth medium nutrient sampling and subsequent fertilization recommendations from a qualified soil scientist and/or soils laboratory.

Straw mulch would be applied to the growth medium material to reduce erosion, promote stabilization, and enhance seed germination. It is anticipated that approximately 2 tons per acre of certified weed-free straw mulch per acre would be applied.

Regraded areas would be broadcast seeded with plant species approved by the Forest Service. The seed mixture to be used as part of the reclamation bond calculation is set forth in table 9 above. The ultimate species selection would be based on a Forest Service listing of reclamation plants, seed availability, and cost. Fertilizing and seeding would be conducted in June to take advantage of the July and August rainy season moisture.

Reclamation Goals, Management, and Monitoring

The reclamation goals at the project site are to:

- Stabilize the site
- Establish a vegetative community for future wildlife use and grazing use

The Minerals Management Division (MMD) of the New Mexico Energy, Minerals and Natural Resources Department (EMNRD) has established Closeout Plan Guidelines (dated April 30, 1996) regarding revegetation monitoring for non-coal mines. The suggested revegetation standards and sampling methods for mining reclamation work are included in attachment 2 to the Closeout Plan Guidelines.

Under 19.10.12.1204 (A) of their non-coal mining rules and regulations, the MMD requires a 12-year period of liability (after mine closure and reclamation) for a reclamation bond for non-coal mining operations within New Mexico. This agency also requires that revegetation monitoring and sampling be undertaken, at a minimum, during the last 2 years of the liability period, to ensure that the project site revegetation meets their required standards.

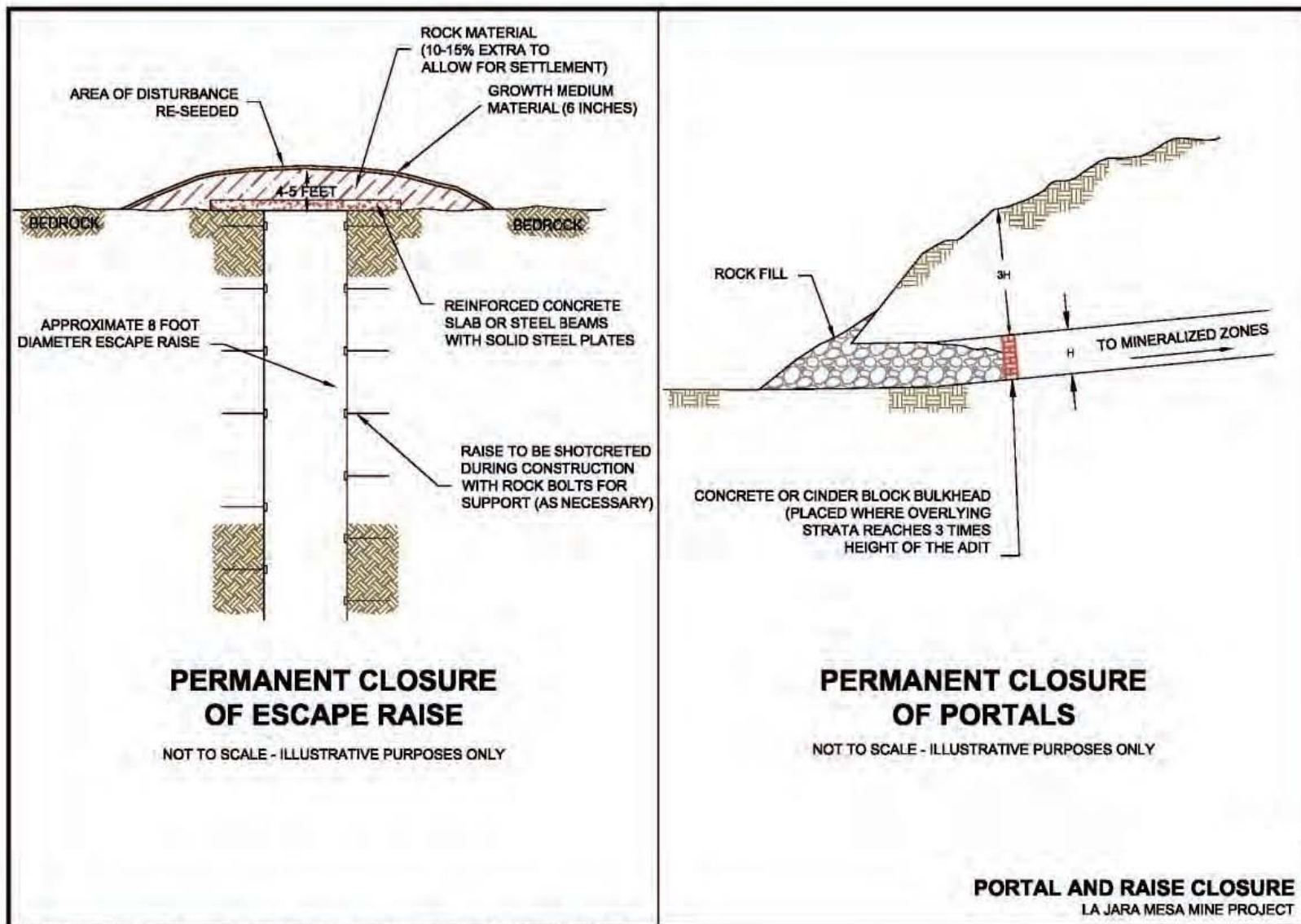


Figure 6. Portal and raise closure

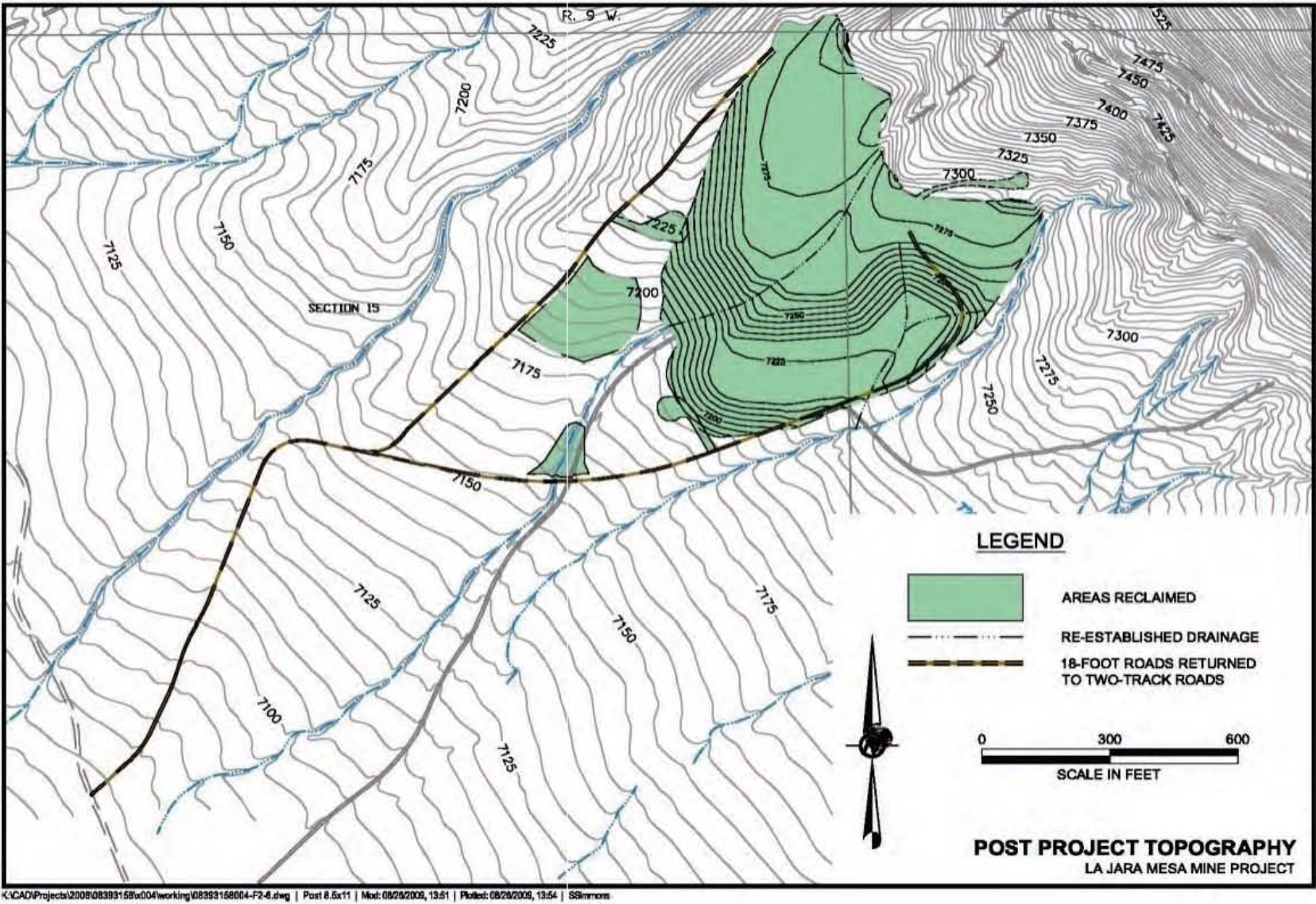


Figure 7. Post project topography

Reclamation Costs for Financial Assurance/Bonding Purposes

Costs presented in this section for reclamation efforts at the project site are preliminary and would be revised based on requirements put forth by the Forest Service and the EMNRD. They are presented here as a basis for future bonding requirements for the project. The applicant estimates that the reclamation costs (for bonding purposes) for the project would range from approximately \$250,000 to \$425,000, as presented in table 10.

Table 10. Estimated costs for reclamation

Direct Costs	
Facility demolition and removal from site	\$50–60,000
Portal and escape raise closure	\$10–20,000
Final site grading	\$40–50,000
Replacement of growth medium material	\$20–35,000
Revegetation work (fertilizer, mulch, seed, etc.)	\$15–25,000
Reclamation monitoring	\$25–40,000
Subtotal	\$160–230,000
Mobilization/demobilization (5 percent of above subtotal)	\$8–12,000
Total Direct Costs	\$168–242,000
Indirect Costs	
Plan engineering (5 percent of total direct costs)	\$8–12,000
Contractor profit (15 percent of total direct costs)	\$25–35,000
Contract administration (15 percent of total direct costs)	\$25–35,000
Total Indirect Costs	\$58–82,000
Total Reclamation Costs	
Total direct and indirect costs	\$226–324,000
General contingency (10 to 30 percent)	\$ 23–97,000
Total Reclamation Costs	\$249–421,000

Given the small area surface disturbance, the lack of an onsite mill or tailings facility, and the company's knowledge of reclamation costs estimated for the surface facility areas for other non-coal underground operations in the U.S. and Canada, the applicant believes that this estimate range is reflective of reclamation costs for other similar operations.

This estimation is not intended for use as the basis for the financial assurance bond to be eventually filed with the Forest Service and the MMD of the New Mexico Energy, Minerals and Natural Resources Department, but rather it is presented for illustrative purposes. The final reclamation cost estimate used for financial assurance bonding purposes would be calculated based upon the final agreed-to site closure and reclamation plans. Sufficient detail would be

incorporated in the final reclamation cost estimate to satisfy the bonding requirements of both agencies.

The MMD of the New Mexico Energy, Minerals and Natural Resources Department has established Closeout Plan Guidelines (dated April 30, 1996) that set forth the methodology for calculating the reclamation bond amounts for non-coal mines. These cost calculation methods are found in attachment 4, Financial Assurance Calculation Handbook, of the Closeout Plan Guidelines. The applicant would consult these guidelines when calculating the detailed reclamation cost for the project.

Gamma Ray Emission Baseline Monitoring

Prior to any project related disturbance at the site, the applicant would sample the background radiation at the portal site and the surface site of the proposed escape raise. Gamma ray emissions would be used as the basis for establishing the background standard. Readings would be taken approximately 1 meter above the ground and would be taken unshielded, with a Ludlum microR or similar gamma radiation measuring device.

Following the completion of reclamation activities, gamma ray emission readings would again be taken at the closed and sealed portal site, the area of the reclaimed waste rock stockpile, and the area above the closed and sealed escape raise. The goal of these readings would be to verify the level of gamma ray emissions do not exceed the background radiation readings. Additional post-reclamation monitoring is discussed below.

In the event that background radiation levels cannot be replicated, the applicant would work with the Forest Service to revise the reclamation work so compliance can be achieved or determine that alternate closeout radiation levels be met that are not less stringent than established by guidelines or standards of the Nuclear Regulatory Commission (NRC) or the EPA.

Best Management Practices

The applicant also developed and proposed the following management practices to be used as part of the entire proposed action alternative to reduce potential impacts. These measures are based on Federal, State, and local laws and regulations, current technology, and best management practices (BMPs). The objective of the measures summarized below is to reduce or avoid adverse impacts to the environment and to reclaim disturbed areas.

Erosion and Sediment Control Measures

- Stormwater management controls would be implemented to include construction and maintenance of diversion channels to route precipitation runoff away from facilities at the portal site.
- No dirt moving activities (i.e., improvements of access roads or construction of portal site) would occur when soils are too wet to support heavy equipment. In the event of heavy rains, construction work at the site would be delayed until soil conditions improve.
- Travel across drainages would be restricted to existing roads.
- Off-road vehicle use outside of the 16.4-acre footprint is not permitted.
- The applicant would implement concurrent reclamation activities when practical (proper season, etc.).

- The pad area at the surface portal site would be graded to control surface water runoff. Upon permanent site closure, the pad would be reclaimed to allow for surface water runoff and minimal infiltration.
- Salvaged growth medium material stockpiles would be located out of drainage areas to prevent their erosion.
- Seeding would be completed on stockpiled material to prevent wind and water erosion.

Air Quality

- Best Available Control Technology (BACT) would be utilized to control vehicle and equipment emissions and meet applicable Federal and State air quality standards.
- Dust emissions from vehicle use of access roads would be limited by water application, inert dust control materials (vegetable oil, calcium chloride), and/or speed limit controls as appropriate.
- The site access road would be maintained regularly by a motor grader to remove any rock, silt, or other debris to reduce fugitive dust.
- Generators would be maintained on a regular basis to ensure proper operation and to minimize emissions.
- No open burning of garbage or refuse would occur onsite.

Vegetation

- Vegetation removal would be limited to those areas necessary for surface facilities.
- The applicant would control undesirable and noxious weeds within disturbed areas, including hand pulling, hand digging, and biological control to prevent and restrict the spread of noxious weeds.
- Interim revegetation would be employed where practicable to stabilize embankments or structures (i.e., growth medium stockpiles and road cuts and fill), which are expected to remain in place until final reclamation.
- Certified noxious weed-free mulch and seed mixtures would be used to reclaim disturbed areas and control the spread of invasive and noxious weeds.

Wildlife

- Vegetation would be cleared only in areas necessary for project activities.
- Three or four-strand barbed wire fencing would be constructed and maintained around surface facilities, based on state (New Mexico Department of Game and Fish (NMDGF) fencing guidelines) and/or Federal requirements, to exclude livestock but would allow deer passage in either direction.
- Trash and other miscellaneous inert (nonhazardous) garbage that may attract wildlife would be contained in bearproof or bear-resistant containers and hauled to an offsite landfill for disposal.
- Chemicals that may harm wildlife, such as used oils, grease, and antifreeze would be handled separately from nonhazardous trash and garbage.

- A 35-mph-speed limit is proposed for the site access road to minimize the potential for vehicle/wildlife collisions, although slower speeds would be driven at passing pullouts or when conditions require speed reduction.
- No hunting or discharge of firearms would be allowed during construction, development, or mining operations within the fenced boundary of the project site.
- Exterior lighting would be directed downward to avoid impacts to avian species.
- Incorporate “Practices for Avian Protection on Power Lines; The State of the Art in 2006” (Avian Power Line Interaction Committee).

Rangeland Resources

- A noxious weed control plan would be implemented to prevent the spread of such undesirable species into adjacent rangeland.
- Surface facility areas (portal site and escape raise opening) would be fenced to prevent livestock access to the site.
- Reclamation would restore disturbed areas to productive condition following operations.

Noise

- A 35-mph-speed limit would be implemented on the site access road minimizing traffic noise.

Land Use/Recreation

- Only authorized travel (no public access) would be allowed into the project surface facilities area.
- Fencing and signage would be utilized to prohibit unauthorized entry off NM 605 and across private property.
- Firearms would be prohibited on the site, as well as hunting in the surface facility area.

Recreation and Visual Resources

- Trees and other vegetation would be retained wherever practicable to screen facilities and maintain a natural appearance for travelers on NM 605.
- Surface facilities would be sited where they can be screened by topography or vegetation to minimize visual impacts where possible.
- Cuts, fills, and clearings would be placed to blend with the surrounding topography during final reclamation.
- Nonreflective earthtone paints would be used on trailers and other painted surface structures.
- Exterior lighting, directed down and toward the interior of the site, would be kept to the minimum required for safety and security.

Heritage Resources

- The applicant would inform its contractors about relevant Federal and State regulations intended to protect cultural and historic resources and any relevant designated traditional cultural properties in the project vicinity.

- If any cultural resources are encountered during construction or installation of the surface facilities at the project site, construction activities would cease in the area of discovery, the Forest Service would be notified and appropriate resource protection measures developed and implemented per the Forest Service and the New Mexico Historic Preservation Office.

Human Health and Safety

- The applicant would provide and ensure worker safety training and the maintenance of a ground control plan for underground activities.

Monitoring

In addition to these measures, the applicant would design and implement environmental monitoring programs that meet the requirements of the Forest Service and New Mexico agencies with regulatory oversight of the project. These programs would be implemented and maintained as part of the development and mining activities.

The frequencies, types, and locations of monitoring would be developed with the Forest Service and the State, and would be tied to specific planned activities and potential impacts of concern. Some might be tied to field sampling activities undertaken by the applicant as part of the applicant's sampling and analysis plan (SAP). Others might focus on specific Forest Service interests. Possible construction monitoring activities might include air quality, cultural resources, gamma ray emissions, SWPPP compliance, avian nesting, or other topics, including baseline monitoring of various parameters. Monitoring would determine the effects of project activities and the efficiency of mitigation measures. Monitoring would also provide input to government agencies regarding project performance. The information gained during monitoring would be used as the basis for designing additional mitigation or altering existing mitigation measures, as necessary.

The applicant would also monitor for reclamation success according to the plans set forth in the Closeout Plan Guidelines (dated April 30, 1996). Areas to be monitored include placement of growth medium, revegetation success, presence of erosion, and noxious weeds.

Additional mitigation measures suggested by agencies during preparation of this draft EIS are listed in appendix B, "Suggested Mitigation." These measures are not part of the current proposal and were not considered in the effects evaluation, but are currently under consideration by the Forest Service and the project applicant. These and other measures may be incorporated into the project and/or into the final EIS after public review and comment of this draft. A final set of mitigation will be part of the record of decision prepared by the Forest Service upon completion of the final EIS.

Alternatives Considered But Eliminated from Detailed Study

NEPA regulations require that an EIS explore and objectively evaluate reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14).

During the scoping process, no alternatives were brought forth for further consideration or evaluation, other than the suggestion to not permit the mining project as proposed. Because the no action alternative is already considered under NEPA, this alternative is included in this DEIS. Two alternative mining techniques to extract uranium ore were considered by the applicant but were rejected as uneconomical and infeasible, as described below.

Open Pit Mining

Open pit mining (surface mining) was considered but rejected from further evaluation because it is economically infeasible and would create extensive environmental impacts compared to hard rock underground tunnel mining at the La Jara Mesa site. Open pit mining is typically used to recover ore material that is at or near the earth's surface, or in cases where the deposit has a low stripping ratio (depth to mineral deposit compared to thickness of deposit), is preferably large in extent, and is reasonably uniform in value.

Given the depth of 700 feet to access the uranium ore at the La Jara Mesa site, extraction and management of the uranium ore and waste rock would require a significant amount of capital investment and operational costs. In addition, impacts associated with ground disturbance of a large surface area and extraction of uranium ore in an open environment would be substantially greater than using an underground mining method. An open pit mine would require excavation of a hole at the top of the mesa, using a series of benches, or steps, down to a depth of approximately 800 feet and perhaps a half mile across or more. This would require removal and disposal of millions of tons of waste rock overburden and extensive road improvements, drainage control structures, topsoil stockpiles, and infrastructure facilities on top of the mesa.

In addition to considerable surface disturbance, operating an open pit mine would have substantially greater impacts including, but not limited to, impacts to visual resources, heritage resources, soil erosion, rock disposal, air emissions, vegetation and wildlife, noise of operations, and increased use of consumable resources (e.g., water, fuel). For these reasons, open pit mining was rejected as a reasonable alternative and not carried forward through the EIS.

In-situ Leach Mining

In-situ leach mining involves the recovery of mineralized values from an ore deposit by circulating chemical solutions through the ore in its native, essentially undisturbed, geologic state and recovering those solutions for processing. It is a common method of uranium extraction in areas where it is practicable. In-situ leach mining (in-situ recovery) was considered but rejected from further evaluation because it is technically infeasible at the La Jara Mesa site due to the physical condition(s) of the deposit and the surrounding area not being amenable to in-situ leaching. It also creates greater risks of impacts to surface and ground waters than underground mining because of handling and injection of chemicals.

The deposit is located in a nonsaturated environment; therefore, a large amount of water would need to be brought in and pumped into the ground. If poor permeability exists at the mine site, as expected, it would be unlikely that proper hydrostatic pressure to leach (dissolve) and move the uranium material could be established. There would be no practical way to control the leach solutions given the ore zones' proximity to the edge of the mesa, the existence of multiple historic drill holes that have penetrated the area, and the known faulting in and around the projected ore

zones. Therefore, this method could create groundwater flow issues at a site where there currently are none.

Additional environmental impacts to the surface of La Jara Mesa from in-situ leach mining would include the construction and installation of numerous wells, roads to each well head, surface or buried water and solution pipelines on the mesa, and a recovery mill, complete with water storage ponds. This would result in hundreds of acres of disturbance on La Jara Mesa compared to the proposed underground mining project. For these reasons, in-situ leaching was rejected as a reasonable alternative and not carried forward through the EIS.

Chapter 3. Affected Environment and Environmental Consequences

Geology and Soils

Affected Environment

Geology

Location and Physiography

The project site is located in the south-central portion of the San Juan Basin in the Navajo section of the Colorado Plateau physiographic province, an area that includes broad, volcanic capped mesas and wide valleys. The project site is located on the western side of the Mt. Taylor volcano, which rises to an elevation of 11,389 feet. The volcano is 1.3 to 3 million years old (Perry et al. 1990). The project area is located on the southwestern portion of La Jara Mesa, which is capped by Mt. Taylor volcanic rocks and underlain by Cretaceous and Jurassic sedimentary strata, which are exposed in the slopes of the mesa.

Regional Stratigraphy

The geologic units and regional stratigraphy of the project area are described in Lucas et al. (2003). The geologic section of interest ranges in age from Permian to Quaternary, and is dominated by Jurassic and Cretaceous sedimentary rocks that are exposed in the slopes of the mesa. The top of the mesa is capped by Tertiary volcanic rocks. A generalized stratigraphic section is shown in figure 8.

The lowermost and oldest geologic units are the Permian Glorieta Sandstone and the San Andres Limestone, which are not exposed at the surface in the project area, but are a confined aquifer in the region. The San Andres Limestone and underlying Glorieta Sandstone are located at a depth of about 1,800 feet and have an estimated thickness of about 75 feet at the La Jara Mesa project site.

Overlying the San Andres Limestone is a thick sequence of Middle Triassic marine shales and siltstones of the Moenkopi Formation, and sandstones and shales of the Upper Triassic Chinle Group. The thickness of the Chinle Group is estimated between 1,000 and 1,600 feet (Laramide 2008). The Middle Jurassic Entrada, Wingate Sandstones, and Todilto Limestone overlie the Chinle Group in the project area. The Entrada/Wingate is an eolian sandstone that ranges in thickness from 150 to 185 feet (Laramide 2008). The Todilto Limestone is a thick bedded limestone that overlies the Entrada and is between 25- and 35-feet thick.

Upper Jurassic rocks, from oldest to youngest, include the Summerville Formation, Bluff Sandstone, and Morrison Formation, which hosts the targeted mineralization. The Summerville Formation consists of interbedded mudstones, siltstones, and very fine-grained sandstones with an estimated thickness of 160 to 270 feet in the project site area (Laramide 2008). Overlying the Summerville is the Bluff Sandstone, estimated to range from 235 to 370 feet thick, which consists predominantly of fine to medium grained eolian sandstone.

The Morrison Formation has been delineated in the project area by the applicant as follows (Laramide 2008): the Recapture Shale Member, the Westwater Canyon Member, and the Brushy Basin Member. The Recapture Shale overlies the main body of the Bluff Sandstone and is about 50 feet thick in the area. It is overlain by between 80 and 100 feet of medium and coarse grained sandstone of the Westwater Canyon Member. The Westwater Canyon unit is overlain by the Brushy Basin Member, which consists predominantly of shale with interbedded sandstones, and

ranges in thickness from 100 to 180 feet. The Brushy Basin includes the Poison Canyon sandstone beds that are host to the targeted uranium mineralization. The Poison Canyon contains from one to four sandstone units and mudstone separated by thin but distinct shale layers and ranges in thickness from 30 to 85 feet (Chapman 1979).

Above the Morrison Formation are the Middle Cretaceous Dakota Sandstone and overlying Mancos Shale. The Dakota, estimated to range from 40 to 90 feet thick, is overlaid by 150 to 200 feet of marine shales that comprise the Mancos. La Jara Mesa is capped by a sequence of Tertiary (Miocene-Pliocene age) volcanic rocks associated with the Mt. Taylor volcanic field. The cap is composed of an extrusive rhyolitic flow with an overlying basalt unit. The thickness of the extrusive rhyolitic flow is estimated to range from 190 to 230 feet, and the basalt from 85 to 110 feet (Laramide 2008).

In the areas west and south of La Jara Mesa and on the slopes of the mesa, Quaternary (Pleistocene age) talus and landslide deposits occur on the mesa slopes, with dune sand deposits along the break in slope near the base of the mesa and alluvial deposits along drainages. Dune and alluvial deposits are extensive west of the project site, with alluvial deposits becoming dominant along San Mateo Creek.

Regional Geological Structure

The project site is located in the south-central portion of the Grants uranium belt, which extends in a west-northwest trend about 15 to 20 miles wide and nearly 100 miles long. It extends from near the Rio Grande on the east to the Gallup area to the west. Structurally, it crosses the northern end of the Zuni uplift and the Chaco slope, which is the southern flank of the San Juan central basin. It also extends beneath Mt. Taylor, where it crosses the Acoma sag.

This area has been subjected to several minor and one major deformation since Morrison time to the present (Kelley 1963). The first deformation occurred shortly following Morrison deposition and created minor folding in the Ambrosia Lake area. The major deformation in the area occurred in the Late Cretaceous-Early Tertiary, and is referred to as the Laramide Orogeny, which gave rise to the Zuni uplift, the San Juan Basin and the Acoma embayment. At this time the principal folds and faults in the Grants and Ambrosia Lake areas were developed and the northerly dips of the sedimentary strata were established.

The next stage of significant structural deformation began in Pliocene time with the development of the Rio Grande Rift. The Mt. Taylor eruptions developed their modern aspect in late Pliocene time. The Mt. Taylor volcanic center is part of a larger, northeast trending volcanic field that includes Mesa Chivato, a broad plateau located northeast of the Mt. Taylor cone. Basalt that caps Mesa Chivato and other mesas surrounding Mt. Taylor (including La Jara Mesa) make up about 80 percent of the volume of the volcanic field (Perry et al. 1990). The Mt. Taylor volcanic field lies on the southern flank of the San Juan Basin on the Colorado Plateau and straddles the extensional transition zone between the Colorado Plateau and the Rio Grande Rift. It also is considered part of the Jemez lineament, a zone of volcanism aligned along a Precambrian suture in the Earth's crust.

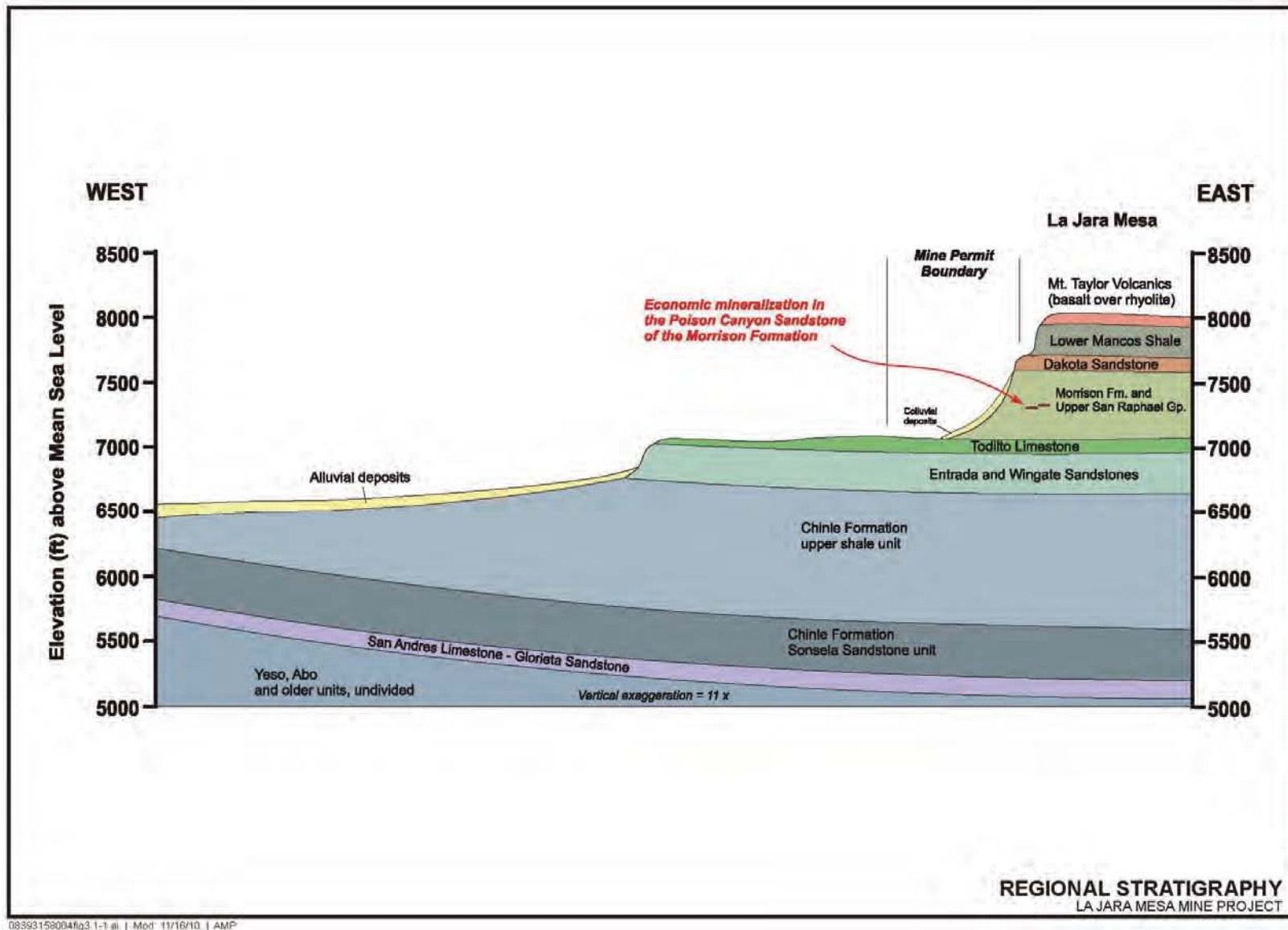


Figure 8. Regional stratigraphy

Seismicity

The potential seismic hazard in the Grants region is generally low (Petersen et al. 2008). Work by Kuo-wan et al. (1997) was used to estimate seismic hazards in New Mexico between 1962 and 1995. Their estimates were obtained by combining the temporal probability of occurrence with the spatial probability of occurrence and a relation between ground acceleration and magnitude. These workers estimated ground acceleration at 10 percent of exceedances in a 50-year period. In general, seismic hazards in New Mexico were considered moderate to low, with the highest ground acceleration of 0.21 g and the lowest near 0 g. Most of New Mexico's historical seismicity has been concentrated in the Rio Grande Valley between Socorro and Albuquerque, with about half of the earthquakes of intensity VI or greater (Modified Mercalli intensity) occurring in this region. In the project area, ground acceleration was estimated at 0.10 g. A magnitude 4.1 shock was recorded near Grants on December 24, 1973, which caused minor damage and was felt in the communities of Laguna, Bluewater, and Fort Wingate.

Soils

Topography in the vicinity of the project area varies from nearly level mesa tops and alluvial fans and valleys, to near vertical cliffs with slope gradients ranging from 0 to 120 percent. The area is characterized as dissected pediment that ranges in elevation from about 6,800 to 7,600 feet above mean sea level (AMSL). The road and utility corridor leading to the mine opening at the base of the mesa is comprised of dissected pediment and alluvial fan surfaces that parallel the escarpment and are moderately steep to gently sloping. The area is drained by several small ephemeral drainages that begin along the escarpment and drain south and west toward San Mateo Creek, approximately 4 miles away. These drainages are dry except during periods of measureable precipitation.

The Forest Service completed a terrestrial ecosystem survey (TES) for the Mt. Taylor Ranger District that includes the area around the project site using the Southwestern Region TES approach (USFS 2007). The TES approach classifies terrestrial ecosystem units and associated soils at a landscape or land unit scale for use in natural resource inventory, monitoring, and evaluation; land management planning; and making predictions and interpretations for management of National Forest System lands (USFS 2005). The distribution of TES units in the immediate vicinity of the project area is shown on figure 9.

Soils types in the project area are varied, reflecting the differences and interactions between topography, elevation, parent material, and time. Parent materials are derived from both sedimentary and igneous rocks. The soils are formed in unconsolidated Quaternary alluvium and eolian materials from mixed sources, as well as residuum and colluvium derived primarily from Cretaceous and Jurassic sandstones and shales, and Tertiary basalt and tuffs from Mt. Taylor volcanic activity. Table 11 identifies the taxonomic class and key properties of the dominate soils of the TES map units in the project area. Soils are generally loamy with poor topsoil qualities although ranging from low to high in revegetation potential.

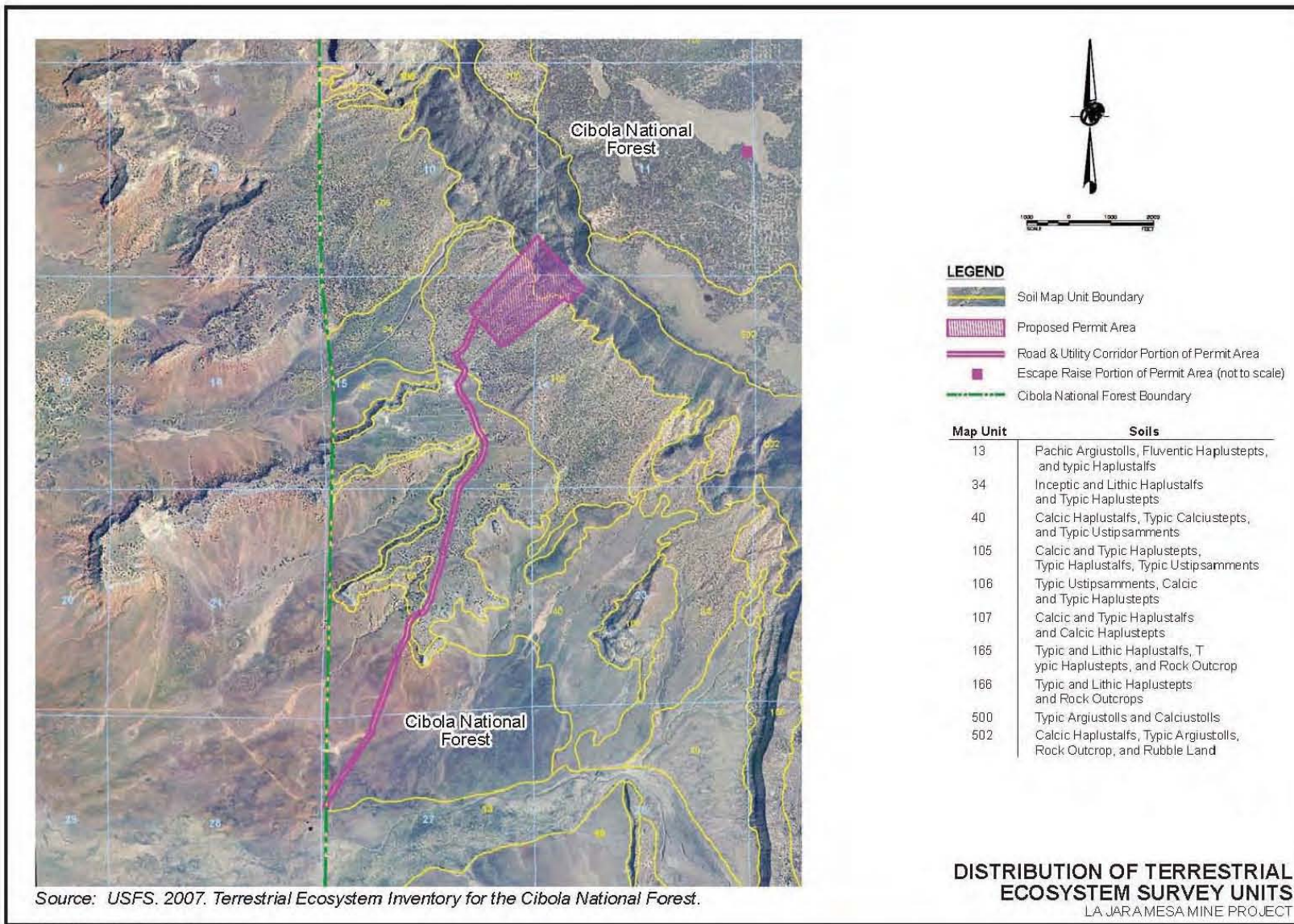


Figure 9. Distribution of terrestrial ecosystem survey units

Soils within Map Unit 105 (MU105) are dominant in the proposed mine portal area. They are moderately deep to deep and excessively well drained, having formed in coarse and moderately coarse textured eolian sand deposits that occur along the base of the La Jara escarpment. Escarpment soils (MU502) are moderately deep to deep, well drained soils formed in coarse and moderately coarse textured colluvium and residuum from basalt. Rock outcrops and rubble lands consist of barren or nearly barren exposures of basalt and comprise 30 percent of the map unit. The soils in the portal area support a pinyon-juniper woodland plant community.

Soils that would be traversed by the access road and utilities below the project area are derived from eolian, alluvium, and residuum from mixed sources. They range from very shallow to very deep, medium to moderately coarse textured soils on nearly level to moderately steep slopes. Closer to the escarpment, these soils support an open pinyon-juniper plant community with an understory of mixed shrubs and warm season grasses including grammas (*Bouteloua* spp.) and dropseeds (*Sporobolus* spp.). Further downgradient, tree species are replaced by shrubs, including four-winged saltbush, rubber rabbitbrush, winterfat, and snakeweed.

At the escape raise, MU107 soils are very similar to the coarse and moderately coarse textured eolian soils at the base of La Jara Mesa. These soils support a mixed conifer plant community with a ponderosa pine and pinyon-juniper overstory.

Soil interpretations pertinent to mining and reclamation operations are provided for each dominant soil map unit (USFS 2009). Map unit interpretations were based on the morphological properties in combination with other landscape parameters (USFS 1974; NRCS 1998). Ratings or interpretations are made according to the limitations and/or restrictive features of a soil relative to a specific use. Where a soil may have a limitation or is poorly suited for a specific use, management alternatives can be identified and developed to address the limitation. In other words, soil interpretations do not dictate the use or suitability of a soil, but evaluate their relative potential for a specific use and the effectiveness of mitigation measures. Table 12 presents the soil interpretations for the dominant soil map units in the vicinity of the project area. Brief descriptions of the suitability ratings and hazard interpretations are provided below.

Topsoil Suitability – This evaluates the upper 100 cm of soil material in its ability to establish and maintain vegetation. Topsoil suitability is typically evaluated as a function of inherent fertility (which includes soil texture), soil pH, slope gradient, and rock fragment content.

Roadfill – Roadfill material refers to excavated and transported soil for use in road embankments. The interpretation is based upon a soil texture, rock content, slope, depth to bedrock or a water table, and shrink-swell potential. The rating also assesses the amount of material, the ease of excavation, and its performance after placement.

Revegetation Potential – Revegetation potential refers to the probable success and ease in the establishment of native grasses and shrubs as a function of climate, soil characteristics (i.e., inherent soil fertility, onsite erosion, shrink-swell potential, coarse fragment content, and soil pH), and slope.

Cutbank Stability – This evaluates the susceptibility of soil to slumping following the construction and maintenance of exposed vertical cuts particularly along roads. This assessment is similar to the mass wasting hazard.

Table 11. Soil map units and their component soil properties in the vicinity of the La Jara Mesa Mine Project

TES Map Unit	Soil Taxon	Particle Class	MU Comp (%)	Depth Class¹	Soil Texture²	Rock Content (% vol)	Slope Range (%)	Landform	Parent Material
Mine Portal									
105	Calcic Haplustepts	loamy-skeletal	50	MD	FSL	0	0-15	Sand Sheet-deposition	Eolian - undifferentiated
	Typic Haplustepts	coarse-loamy	30	D	LFS	0	0-15	Sand Sheet-deposition	Eolian - undifferentiated
107	Calcic HaplustalFs	fine-loamy	50	D	FSL	0	0-15	Sand Sheet-deposition	Eolian - undifferentiated
	Typic HaplustalFs	coarse-loamy	30	D	FSL	0	0-15	Sand Sheet-deposition	Eolian - undifferentiated
502	Calcic HaplustalFs	loamy-skeletal	40	D	CB-SL	75	15-80	Scarp-Mesa	Colluvium/residuum - basalt
	Typic Argiustolls	loamy-skeletal	30	MD	CB-L	65	15-80	Mesa	Colluvium/residuum - basalt
Road Corridor									
13	Pachic Argiustolls	coarse-loamy	45	VD	SIL	5	0-15	Flood Plain	Mixed alluvium
	Fluventic Haplustepts	fine-loamy	25	VD	SIL	0	0-15	Valleys	Mixed alluvium
34	Inceptic HaplustalFs	fine-loamy	50	D	FSL	0	0-15	Valleys	Mixed alluvium
	Inceptic HaplustalFs	coarse-loamy	20	D	FSL	0	0-15	Valleys	Eolian - sandstone
	Typic Haplustepts	sandy	20	VD	FSL	0	0-15	Valleys	Eolian - sandstone
40	Calcic HaplustalFs	fine-loamy	40	VD	L	5	0-15	Valleys	Alluvium - tuff
	Typic Calcustepts	fine-loamy	40	VD	SL	5	0-15	Valleys	Alluvium - tuff

165	Typic Haplustalfs	fine	35	MD	FSL	5	0-15	Mesa	Residuum - sandstone
	Typic Haplustalfs	fine-loamy	25	MD	FSL	5	0-15	Mesa	Residuum/eolian - sandstone
	Lithic Haplustalfs	loamy	25	VS	FSL	5	0-15	Mesa	Residuum/eolian - sandstone
166	Typic Haplustepts	NA	50	MD	NA	65	15-80	Scarp-Mesa	Colluvium/residuum - sandstone
	Rock Outcrop		30				15-120	Scarp	Sandstone

NA = not available

VD = Very Deep (> 60 inches); D = Deep (40-60 inches); MD = Moderately Deep (20-40 inches); VS = Very Shallow (<10 inches)

F = Fine; S = Sand or Sandy; L = Loam or Loamy; SI = Silt or Silty; CB = Cobbly

Source: USFS 2007

Table 12. Interpretative properties for soils in the vicinity of the La Jara Mesa Project

TES Map Unit	Soil Taxon	Suitability and Hazard Ratings							
		Topsoil	Roadfill	Unsurfaced Road	Revegetation Potential	Cutslope	Erosion Hazard	Mass Wasting	K-Factor
Mine Portal									
105	Calcic Haplustepts	Poor ¹	Fair ⁷	Moderate ⁷	High	Slight	Moderate	Low	0.28
	Typic Haplustepts	Fair ²	Good	Slight	Low ⁹	Slight	Slight	Low	0.20
107	Calcic Haplustalfs	Good	Fair ⁶	Moderate ⁷	High	Slight	Slight	Low	0.28
	Typic Haplustalfs	Good	Good	Slight	Low ⁹	Slight	Slight	Low	0.28
502	Calcic Haplustalfs	Poor ⁴	Poor ⁴	Severe ⁴	Low ⁴	Severe ⁴	Moderate	High	0.15
	Typic Argiustolls	Poor ⁴	Fair ⁷	Severe ⁴	Moderate ⁴	Severe ⁴	Moderate	High	0.05

TES Map Unit	Soil Taxon	Suitability and Hazard Ratings							
		Topsoil	Roadfill	Unsurfaced Road	Revegetation Potential	Cutslope	Erosion Hazard	Mass Wasting	K-Factor
Road Corridor									
13	Pachic Argiustolls	Good	Fair ⁶	Moderate ⁶	Moderate ⁸	Slight	Slight	Low	0.43
	Fluventic Haplustepts	Poor ¹	Fair ⁶	Moderate ⁶	Moderate ⁸	Slight	Slight	Low	0.43
34	Inceptic Haplustalfs	Poor ²	Fair ⁶	Moderate ⁶	Moderate ⁸	Slight	Moderate	Low	0.28
	Inceptic Haplustalfs	Poor ³	Good	Slight	Low ¹	Slight	Slight	Low	0.28
	Typic Haplustepts	Poor ²	Good	Slight	Low ²	Slight	Slight	Low	0.20
40	Calcic Haplustalfs	Poor ⁴	Fair ⁶	Moderate ⁶	High	Slight	Moderate	Low	0.37
	Typic Calciustepts	Poor ⁵	Good	Slight	Low ¹	Slight	Moderate	Low	0.24
165	Typic Haplustalfs	Poor ³	Poor ⁶	Severe ⁶	Moderate ⁸	Slight	Moderate	Low	0.28
	Typic Haplustalfs	Fair ³	Fair ⁶	Moderate ⁷	Moderate ⁸	Slight	Slight	Low	0.28
	Lithic Haplustalfs	Poor ⁵	Poor ⁷	Severe ⁷	Moderate ⁸	Slight	Moderate	Low	0.28
166	Typic Haplustepts	Poor ⁴	Poor ⁴	Severe ⁴	Low ⁴	Severe ⁴	Severe	High	0.10
	Rock Outcrop								

¹ too alkaline; ² too sandy; ³ too clayey ; ⁴ slope; ⁵ too thin ; ⁶ low strength ; ⁷ too shallow ; ⁸ too arid; ⁹ droughty

Source: USFS 2007

Unsurfaced Roads – This rating pertains to limitations of soils associated with unsurfaced roads of low design, minimal costs, and limited maintenance. It is primarily a function of soil texture, drainage characteristics, slope, depth to bedrock, alkalinity, shrink-swell, and erosion and mass movement potential.

Erosion Hazard – This refers to the relative susceptibility of a soil to water erosion upon removal of all vegetation and litter. The rating assesses sheet and rill erosion hazards remaining after a site has been disturbed that would result in a reduction of site productivity if left unchecked. The rating is primarily a function of soil erodibility (K-factor) and slope.

Mass Wasting Hazard – This assesses the inherent stability of landscapes from surface creep to landslides. It is a function of the presence of saturated soils on steep slopes, historically unstable rock formations, slope gradient, aspect, fine textured materials, evidence of past movement, and coarse fragment content. Map units with slopes less than 50 percent have slight mass movement potential.

K-Factor – The soil erodibility or K-factor quantifies the ease of soil detachment by rainfall as part of the Revised Universal Soil Loss Equation (RUSLE). RUSLE primarily predicts soil loss associated with sheet erosion (Renard et al. 1997). The K-factor is a function of soil texture, rock fragments, organic matter, soil structure, and permeability class and typically ranges from 0.01 to 0.64.

In the project portal area, coarse textured eolian soils (MU105) are droughty and can be difficult to revegetate. These sandy soils are also subject to wind erosion, especially when vegetation is removed. The dominant component of MU105 is soil with alkaline subsoils because of pedogenic carbonates that, when exposed at the surface, can make revegetation difficult. Escarpment soils (MU502) have a high mass wasting hazard rating due to steep slopes, but high rock fragment contents make the erosion hazards moderate. Steep slopes make it difficult to salvage these soils, but as a growth media for revegetation, there are no limiting inherent soil properties for their use as a reclamation substrate.

Soils along the road and utility corridor have an overall moderate rating as a roadfill source and as an unsurfaced road. Erosion hazards are also rated moderate for most soils. Their suitability for use in reclamation varies, but generally they have a moderate revegetation potential.

Environmental Consequences

Geology

Impacts to geology would include permanent changes in landforms, foundation and slope stability, and/or ore deposit.

No Action Alternative

Under the no action alternative, the uranium ore would not be disturbed by exploration or mining, and the structural and lithologic integrity of the site would remain in place. The geology of La Jara Mesa at the base and the top would not be affected by the portal and mine tunnel or the escape raise, respectively. The potential to recover the uranium resources or conduct exploratory drilling at some time in the future would remain. Other than continued use of existing private and Forest Service roads, no impact to the geologic and mineral resources would occur.

Proposed Action

Construction

Development of the mine would result in permanent removal of rock and mineral resources from the underground workings and create a disturbed surface area of about 16 acres that would be reclaimed after mining ceased. Rock from the mine would remain near the base of the portal in a raised pile after facilities, buildings, and other structures were removed. Side slopes would meet reclamation requirements and would not exceed a slope of 3:1. Phase 1 construction would be limited to unmineralized rock removal from the adits and placement in the waste rock area outside of the portal. Phase 2 construction would include additional waste rock removal from the escape raise and from nonmineralized rock areas located between mineralized (ore) deposits. It would also include placement in the waste rock area or, in some cases, placement in abandoned mine areas where ore recovery has been completed.

Operation

Mine development would affect existing geologic resources and the landforms adjacent to the mine opening, due to the underground mining and footprint of the disturbed and waste rock area. No such footprint or geologic impact would exist at the raise opening because all waste rock will be excavated from below and would fall into the mine and be removed. Surficial geology outside of the portal area would be covered by waste rock and contoured for slope stability or as foundation material.

Subsidence

There would be no potential for surface expressions of mining subsidence on the top of La Jara Mesa due to the significant depth of and the limited volume of rock removed during development of the mine workings, and the lack of groundwater. Shallow mines (between 50 and 300 feet below the surface) and groundwater depletion have been the cause of most subsidence events. There would be some potential that mining subsidence features could develop locally within and adjacent to the underground mine workings, particularly in the immediate portal opening area. Based on existing information and the appropriate design and construction practices, these features would not be expected to cause damage to surface resources or overlying structures, including the face of the mesa immediately above the mine portal. After sealing and closure of the top of the escape raise, the likelihood of future subsidence would be very low. The rocks in and around these localized subsidence features are unsaturated and are separated from underlying saturated rocks by hundreds of feet of sedimentary strata, so they would not adversely affect groundwater resources beneath the site.

Landslide and Rockfall Hazards

A landslide is a geologic hazard characterized by a perceptible sliding or falling of a relatively dry mass of earth, rock, or a mixture of the two. Rockfalls are geologic hazards, as well as characterized by free falling rock masses. The degree of risk posed by landslides or rock falls relative to the proposed project would be moderate along the steeper portion of the project site below La Jara Mesa. The risk of future movement in the mine project area would be reduced by appropriate design and construction practices (engineered excavation and grading) and by active mitigation techniques such as: control of surface and subsurface drainage, rock tieback anchors, and rock scaling and buttressing as necessary, especially in the portal area of the mine.

Seismic Hazards

Earthquake risk in the project area is considered low. No active faults have been identified in the project area that would require consideration of surface movement. The project mine area is believed to be stable for buildings, underground workings, and most other construction/mining activities.

Cumulative Effects

Cumulative effects to local geology consider other past, present, and reasonably foreseeable actions in the immediate mine footprint vicinity, at La Jara Mesa and Mt. Taylor as a whole, and in the region.

Past impacts to geology include local road construction and side slope cuts across the face of the mesa in some cases. At the top of the mesa, hundreds of drill holes were bored in the middle to late 1900s to collect rock samples, leaving some waste drilling rock, but minor waste rock disposal. No additional drilling at the top of the mesa over the claim area is envisioned because sampling would be accomplished by the mine itself and no cumulative drilling impacts would occur. Cumulative impacts to geology in the immediate mine area would be minor.

This project is one of many past, present, and future activities on or adjacent to Mt. Taylor itself. There are a number of gravel and quarry mining sites within about 4 miles of the project site, and active uranium exploration occurs in the vicinity of the project site. A new proposed uranium mine is located 8 miles north of the site that, according to the October 2009 application, would disturb approximately 180 acres, include five ventilation holes similar in size to the escape raise, and a rock stockpile of approximately 50 acres. This larger project would contribute to the cumulative geologic impacts of mining on Mt. Taylor. A separate EIS is being prepared for that mine project.

Regionally, the Mining and Minerals Division of the New Mexico Energy, Minerals and Natural Resources Department lists all pending and existing exploration and mining permit applications on their Web site, located at:

http://www.emnrd.state.nm.us/MMD/MARP/permits/MARP_Permits.htm.

The Web site shows current minimal impact exploration permits and approved exploration permit applications, in addition to any new mine applications, such as La Jara Mesa and Roca Honda or others posted since this writing, and all existing mine applications in the State.

Because of the small and localized footprint and impacts to geology, the La Jara Mesa Project would contribute minor effects on geology near the mine and would contribute to the cumulative impacts of other mining and gravel extraction activities on Mt. Taylor and in the region. No effects from this mine are cumulative to other historical mines in the area.

Soils

Potential impacts to soils would include changes in physical, chemical, and biological properties, and loss of soils required for revegetation through compaction or from increased erosion. Due to the small surface disturbance of the proposed action, a qualitative analysis is provided.

No Action Alternative

Under the no action alternative, the mine would not be developed and natural soil processes and properties would not change from present conditions. Soil loss and erosion would be restricted to existing mine exploration and development disturbances in the area including cattle grazing, wildlife grazing, and road use. Erosion and sedimentation would continue to occur at existing rates along Forest Road 450 and other two-track roads in the project area. Soil erosion losses due to rainfall, runoff, and wind would continue at natural rates at other locations.

Proposed Action

Construction

Mine construction and development activities can have unfavorable effects on soils resulting from the removal of vegetation and exposure of the soil to wind and water erosional forces. The direct loss of soil resources is primarily associated with burial, contamination, and accelerated erosion during soil salvage, storage, and redistribution operations. Soil chemical and physical conditions can also be altered by soil salvage and mining, including reductions in fertility, loss of soil structure, increased bulk density through compaction, reduced infiltration and water holding capacity, and changes in the microbial populations.

Approximately 12.9 acres of MU105 and 3.5 acres of MU502 will be impacted by surface facilities in the portal area. Soil depth is described below. At the escape raise approximately ¼ acre of MU107 will be disturbed. Soil loss will occur during the mechanical grubbing of vegetation, excavation soil materials, and transferring materials to the growth media stockpile. These activities expose bare soil surfaces that are susceptible to increased wind and water erosion relative to vegetated conditions. Soil loss due to burial can be mitigated by removing growth media from all areas affected by project surface facilities. The use of silt fences or ditches along the perimeter of the disturbed areas in addition to seeding stockpiles and disturbed areas with native perennial grasses in the first normal planting season will control erosional losses and sedimentation downgradient of the site.

Physical changes in soil structure can also result from the use of heavy machinery to strip, haul, and stockpile soil materials, compacting the materials and thereby increasing bulk density and decreasing porosity and water holding capacity. Compaction can inhibit root penetration, reduce infiltration, increase runoff and erosion, and decrease plant productivity. Handling soils during the rainy season or when soils are wet can be particularly detrimental because compaction is typically more severe. Soil handling activities would be suspended when soil conditions are too wet to support heavy equipment.

Soil salvage activities would blend and homogenize soil resources by mixing topsoil and subsoil materials as well as different soil types. The net effect is that the salvaged materials are physically and chemically more uniform relative to native soils. One result of mixing soil horizons can be the relative reduction in organic matter content and fertility of the salvaged soil. However, the incorporation of slash, roots, and other plant materials during stripping may mitigate the loss of organic matter in the salvaged soils and potential reductions in soil productivity. The incorporation of mulch and organic matter would also improve the quality and fertility of the salvaged soil materials. The establishment of a permanent vegetative cover on stockpiled soil materials can also help retain nutrients.

Site specific soil mapping with chemical and physical characterization will be required for the MMD's Sampling and Analysis Plan (SAP) to identify soils suitable for salvage as a growth medium. The reclamation plan assumes that an average of 6 inches of growth material will be distributed across the 16.4 acres of disturbance. This will require salvaging approximately 13,300 cubic yards of growth media for final reclamation. This is equivalent to removing 12 inches of growth media material off 8.2 acres in the project area. Only soils suitable to support plant growth would be salvaged for use in reclamation. Construction activities include an operation to salvage 0 to 12 inches of surface and near surface soil from areas affected by surface facilities. As needed, subsoil materials would be salvaged when deeper soils are encountered to make sure adequate growth media materials are available for reclamation. The majority of native soils at the project site are deeper than 20 inches (table 11). Salvage of soils to a depth of 20 inches in the 16.4-acre footprint would result in over 44,000 cubic yards of growth media which would exceed the required volume for reclamation purposes. The size of the growth media stockpile depends on the site specific soil characteristics of each identified soil type that would be salvaged including its suitability, thickness, and available volume. This would not be known until quantitative soil sampling is conducted as part of implementing the State's SAP.

Waste rock from the project would be suitable as a subsoil because it would not be acid generating or radioactive. It might also be suitable as a topsoil substitute. Laboratory testing specified in the State's SAP will be used to characterize and determine the suitability of the waste rock from the development phase of the project. One benefit of using suitable waste rock as a topsoil substitute is that it typically does not contain the seeds of annual or noxious weeds. Without the competitive pressure of weeds, the seeded perennial species would more easily become established during the reclamation process.

Soil impacts in the utility corridor/access road are expected to be minor to MU165 and MU34. In general, impacts to soil resources during construction would be moderate to major under the 16.4-acre footprint, but the impacts would be reduced to minor after mitigation through reclamation and monitoring to ensure success. Soil impacts associated with the escape raise are small in aerial extent and are also expected to be minor. Impacts would be successfully mitigated during the construction phase by implementing the reclamation plan, specifically salvaging adequate quantities of suitable growth media, and installing erosion and stormwater controls to retain sediment onsite and reduce downstream impacts. Interim seeding would provide permanent vegetated cover on stockpiled soil resources, control erosion and runoff, and help maintain nutrients. Stormwater diversions, berms, swales, silt fences, and similar BMPs would also help to control erosion and runoff as they provide temporary protection of stockpile soils until vegetation becomes established.

Improvements and frequent maintenance to Forest Road 450 and other access roads would lead to better water management along the roadway relative to the road's current condition. Soil materials would be salvaged and placed in the soils storage pile. Appropriate grading and placement of subbase, gravel and new culverts would stabilize the roadbed and direct runoff away from the road surface. Any accelerated erosion along the road would be corrected as part of routine maintenance to ensure they are suitable and provide continuous site access for haul trucks and personnel, and that runoff control meets stormwater runoff requirements of the SWPPP. Dust from the road corridor would be suppressed with sprayed water several times a day and minimize wind erosion.

Slope failure and landslides have the potential to occur, especially in areas of shale and other soft sedimentary rock. The deepest cuts and fills associated with the project would be located in the proposed portal area. The rock along the portal entrance is sandstone and should not pose a mass wasting hazard. All water flowing from the slope above the portal area would be redirected away with an upgradient diversion into existing drainage channels. Engineering controls may be necessary with the portal face-up and excavation to minimize the potential hazards of landslides and mass wasting.

Operation

Impacts to soil resources during the operation phase of the proposed action are associated with the storage of growth media and its redistribution on final graded surfaces during the reclamation phase. Project development and operations are projected to last between 8 and 20 years, depending on the ore reserves identified during mine development. During this period, stockpiled soil materials are susceptible to wind and water erosion particularly if they have no standing plant cover, litter, or rock to protect the surface. Wind erosion could remove finer grained materials from the stockpile's surface; however, from a volumetric perspective, losses associated with wind erosion would be minor.

Soil loss due to water erosion could permanently decrease the volume of soil materials available for reclamation. No growth medium material would be stockpiled inside of any drainage areas. An erosion and sediment control plan, required as part of the plan of operations, would be implemented to protect soil resources and reduce potential impacts on soils during the operational period of the mine. Based on local hydrological conditions, management practices including sediment traps, berms, dispersion ditches, silt fences, and filter fabric would be used during the life of the project to control erosion. Growth medium stockpiles would also be graded and seeded with perennial grass species to reduce the loss of soil resources by erosion.

Over the operational life of the project, stockpiled soils may lose organic matter relative to undisturbed native soils as a result of microbial activity that would continue to decompose the organic matter and potentially impact nutrient levels. Seeding the stockpiled and windrowed soils with native grasses during the interim would help retain nutrients and organic matter. The areal extent of the stockpiled soil pile will depend on height which is affected by slope and amount of suitable material available. As an example, if 1 foot of soil is removed from suitable soil areas that are anticipated to be covered by rocks and facilities (e.g., 8 acres) and placed in a 1-acre pile, it would be 8 feet high. Actual pile coverage would be larger to allow for side slopes.

Stockpiled soils could also become contaminated if unsuitable materials (e.g., radioactive waste rock) are inadvertently mixed with these materials. The excavated soils would be placed in a separate stockpile away from the designated ore stockpile near the mine portal. Stockpiles could also become contaminated by petroleum products from machinery or contaminated surface water. A spill prevention and control plan (SPCC), required as part of the project's SWPPP, would address spill containment and the equipment to be kept onsite to mitigate a petroleum spill or leaks, and to remove impacted materials. Stormwater from the ore stockpile and waste rock dump would be directed to stormwater basins and away from the growth media stockpile to avoid impacting the soil materials.

During the reclamation phase of the project, regraded areas would be topdressed with 6 inches of growth media and revegetated to restore the land to productive use. The replaced soil would be sampled and analyzed to determine whether nutrient levels are adequate and if a fertilizer

application would be required to establish vegetation. The reclaimed soils would then be seeded with native perennial grass species and forbs and mulched to protect the surface from excessive erosion. Reclamation of access and portal site roads would involve redistribution of windrowed soils and revegetation to restore the area to productive use.

The proposed reclamation plan does not address surface and subsurface compaction in reclaimed soils that could reduce infiltration rates and increase the potential for runoff and erosion. Surface compaction could be reduced or eliminated during seedbed preparation through the use of standard tillage tools like disks and chisels. Deep compaction below 8 inches may occur in areas with heavy equipment traffic and would require ripping tools such as a “subsoiler” for mitigation. Alleviating soil compaction as mitigation would enhance natural processes that would promote the formation of soil structure (i.e., root penetration, soil microbial activity, and freeze-thaw cycles), improve water infiltration, and roughens the soil surface to provide microsites for seedling establishment, and reduces concentrated overland flow and soil loss during the early phases of vegetation establishment.

Although the reclaimed plant community could not be restored immediately to pre-mining productivity due to the time required for plants to fully establish in the semiarid climate, long-term productivity would be maximized by the proposed action’s reclamation procedures. Creating a suitable root zone would provide the foundation to reestablish an effective, stable, and permanent vegetative cover capable of protecting the site from excessive erosion. Soil chemistry, nutrient levels, and physical conditions would generally be more uniform and would likely result in a plant community that is more uniform. Following site decommissioning, reclaimed areas would be monitored for a minimum of 3 years for the presence of soil erosion and vegetation establishment to ensure successful reclamation. Additional soil and erosion monitoring protocols are expected to be developed as part of the State mine permit requirements that include a 12-year period to monitor and evaluate reclamation success.

Impacts to soil resources during the operation and reclamation phase would be moderate to major, but with the implementation of erosion and sediment controls and the proposed reclamation and monitoring plans prepared for this project described above, successful stabilization and reclamation of the site is expected and soil impacts would be reduced to minor.

Cumulative Effects

The cumulative effect on soils considers the impacts of the proposed project when added to soil disruption impacts from activities at the mine site and at Mt. Taylor, ranging from the mid-1900s to the present.

Past impacts to local soils have occurred from road construction and use, including road cuts between NM 605 and the site from private roads and Forest Service roads and Forest Service and other 4-wheel roads across the mesa escarpment. Additional soil impacts in the vicinity of the project resulted from surface disturbances associated with past uranium exploration activities that included drill holes, trenching, and exploratory mining in the middle to late 1900s. No exploratory drilling would occur as part of the proposed action, as ore sampling would be accomplished in the mine itself and road construction would be limited to existing access roads. Because soil impacts would be mitigated through implementation of the reclamation plan, cumulative impacts to soils in the immediate mine area would be minor.

Although the project area represents approximately 0.003 percent of the Mt. Taylor Ranger District, in combination with past, present, and foreseeable future actions, it would result in the incremental increase in impacts to soils in the Cibola National Forest. Other potential mine exploration and development projects in the vicinity of the proposed action include a proposed uranium mine located 8 miles north of the site. The other proposed mine application describes approximately 180 acres of surface disturbance, and would contribute to the soil impacts from mining on Mt. Taylor. A separate EIS is being prepared for that mine project. There are additional permit applications for existing mining operations, and occasional exploration permit requests filed with the MMD. Active uranium exploration occurs in the vicinity of the project site.

Other past, present, and foreseeable actions that contribute to impacts on soil resources in the Mt. Taylor area and the two-county region include gravel mining, recreational uses, road use and construction, timber harvesting, livestock grazing, and utility line construction. The La Jara Mesa Project would contribute to these soil impacts but the soil losses on the 16.4-acre project are very minor compared to the size of Mt. Taylor or the Grants Uranium Belt, and would be even less after reclamation.

Air Quality

Phases 1 and 2 of the project include construction and operation activities for which there would be air emission sources that would include point and fugitive sources.

Phase 1 – Underground development would generate emissions of air pollutants from the following sources:

- Drilling, blasting, and storage of waste rock (nonmineralized)
- Mobile equipment exhaust (mining and surface construction)
- Backup electric generator exhaust
- Fuel and solvent filling, storage, and use
- Disturbed surface wind erosion
- Paved and unpaved fugitive road dust

Phase 2 – Underground mine production would generate emissions of air pollutants from the following sources:

- Drilling, blasting, and storage of both mineralized ore and waste rock
- Surface handling and transport of mineralized ore
- Mobile equipment exhaust
- Fuel and solvent filling, storage, and use
- Backup electric generator exhaust
- Disturbed surface wind erosion
- Paved and unpaved fugitive dust

For purposes of this EIS, it is assumed that ore from phase 2 mining would be transported by truck to and processed at the Denison Mines ore processing facility located in Blanding, Utah, approximately 190 miles northwest of the mine site. Other processing mill location options may

be available by the time phase 1 is completed, but they are not known at this time. Radon emissions are discussed separately.

Affected Environment

Location and Terrain

The La Jara Mesa Mine is located within the Southwestern Mountains-Augustine Plains Intrastate Air Quality Control Region 156 (AQCR 156), which covers 20,256 square miles in western New Mexico. The region's landscape is variable, going from timbered mountain ranges to mesas, plains, and cultivated river valleys. Elevations range from 4,600 feet along the Rio Grande Valley to 11,000 feet in the mountains. The region is drained by the Rio Grande Basin, lower Colorado River Basin, Western Closed Basin, and partially by the Central Closed Basin.

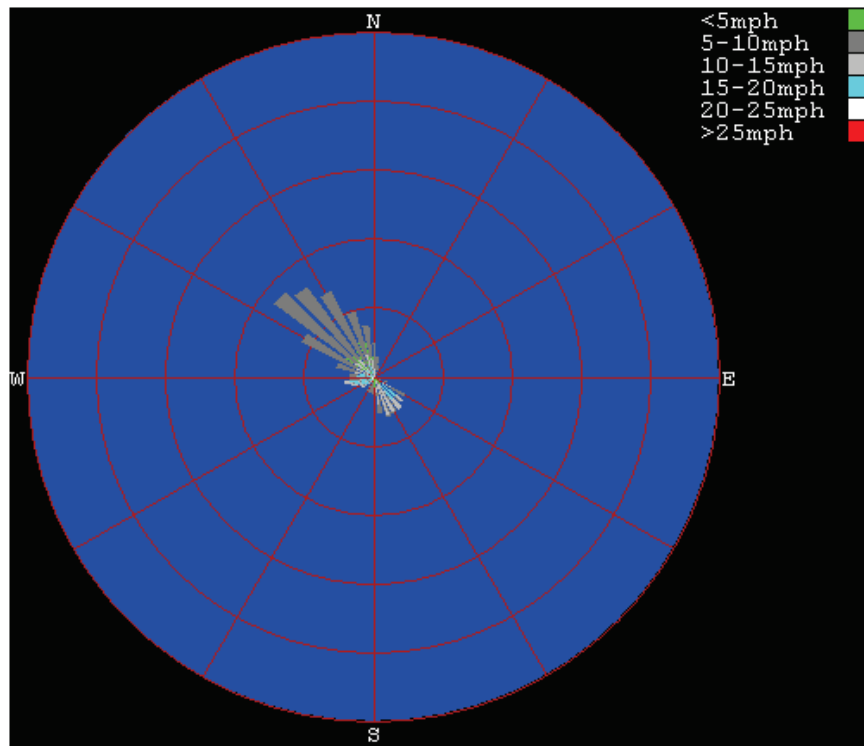
The portal location and support facilities would be located on a southwest-facing slope of the mesa at approximately 7,300 feet above sea level. Terrain to the east rises steeply to a plateau at 8,200 feet and higher, approximately 900 feet above the support facilities. The escape raise portal would be located approximately 700 feet above the mineralized area on the surface of the mesa. The natural resources located within the area of AQCR 156 include a large amount of grazing land and land suitable for farming, timber, and minerals. The nearest residence is approximately 3 miles southeast of the portal location in Lobo Canyon and, therefore, is not considered to be a sensitive receptor. The nearest population center is Grants and Milan, New Mexico (Grants-Milan), located approximately 10 miles southwest of the portal location at an elevation of 6,460 feet above sea level.

Climate and Meteorology

Grants-Milan Municipal Airport is the closest location with reliable meteorological data. Due to its elevation, Grants-Milan has a year-round cool climate. Data provided here are from the New Mexico Climate Center. Average low temperatures in winter and summer are 18 °F and 52 °F, respectively, while average highs are 47 °F and 87 °F. Average rainfall is 10.5 inches; winters have an average snowfall of 12.8 inches. Figure 10 provides a wind rose based on the last 7 years of wind speed and wind direction data from the Grants-Milan Municipal Airport. The abrupt rise of the La Jara Mesa influences local wind direction. While regional wind direction is out of the west-southwest, the mesa results in predominant winds out of the northwest as shown in figure 10. There is virtually no wind downslope from the portal facility location toward Grants-Milan. The nearest residence in the direction of the prevailing wind is approximately 3 miles away (figure 11).

Air Quality Monitoring Data/Regional Emissions Inventory

Criteria pollutants are those pollutants for which there are regulated Federal and State ambient air quality standards. EPA and the State of New Mexico have established ambient air quality standards for criteria pollutants, including carbon monoxide (CO), ozone (O₃), respirable particulate matter (PM₁₀), fine particulate matter (PM_{2.5}), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), and lead (Pb). Additionally, the State of New Mexico has established ambient air quality standards for total reduced sulfur (TRS), total suspended particulate (TSP), and hydrogen sulfide (H₂S).



Each circle represents 2.5% of the total wind for the selected time period.
0% of data is interpolated.

Figure 10. Wind Speed and Direction 2002-2009 at Grants-Milan Municipal Airport (wind directions shown are the location the wind is blowing from).

Source: New Mexico Climate Center 2009
<http://weather.nmsu.edu/cgi-hl/cns/wind.pl?station=kgnt&smonth=01&sday=01&syar=02&emonth=01&eday=01&eyar=09>

The airshed in Cibola County is in attainment/unclassified for all ambient air quality standards, both Federal and State. While New Mexico has an ambient air quality monitoring network for ozone, there are no ambient monitoring stations for ozone near the project site (figure 12). Ozone in the troposphere primarily results from the chemical interaction of volatile organic compounds (VOCs) and nitrogen oxides (NO_x) in the presence of sunlight. There are few sources of these compounds upwind of the project site other than vehicle exhaust.

The most recently available (2002) Cibola County results from the National Emission Inventory are shown in figures 13-19. These figures show the relative contribution of the more common criteria pollutants in Cibola County. While these emission inventory results are 8 years old, it is unlikely that the total and relative magnitude of the emissions have changed significantly due to the sparse population in Cibola County, which was less than 26,000 people in 2000.

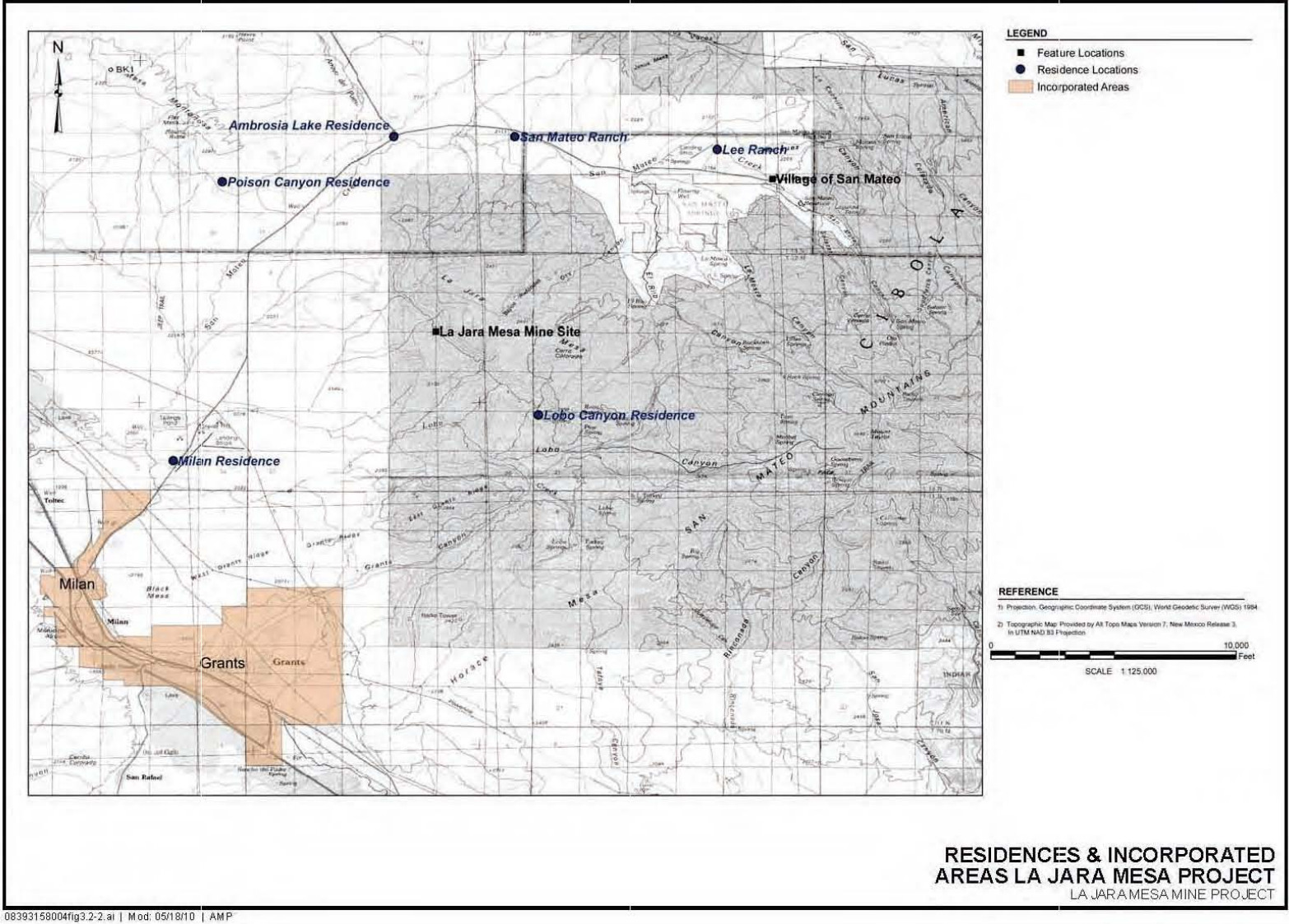


Figure 11. Residences and incorporated areas

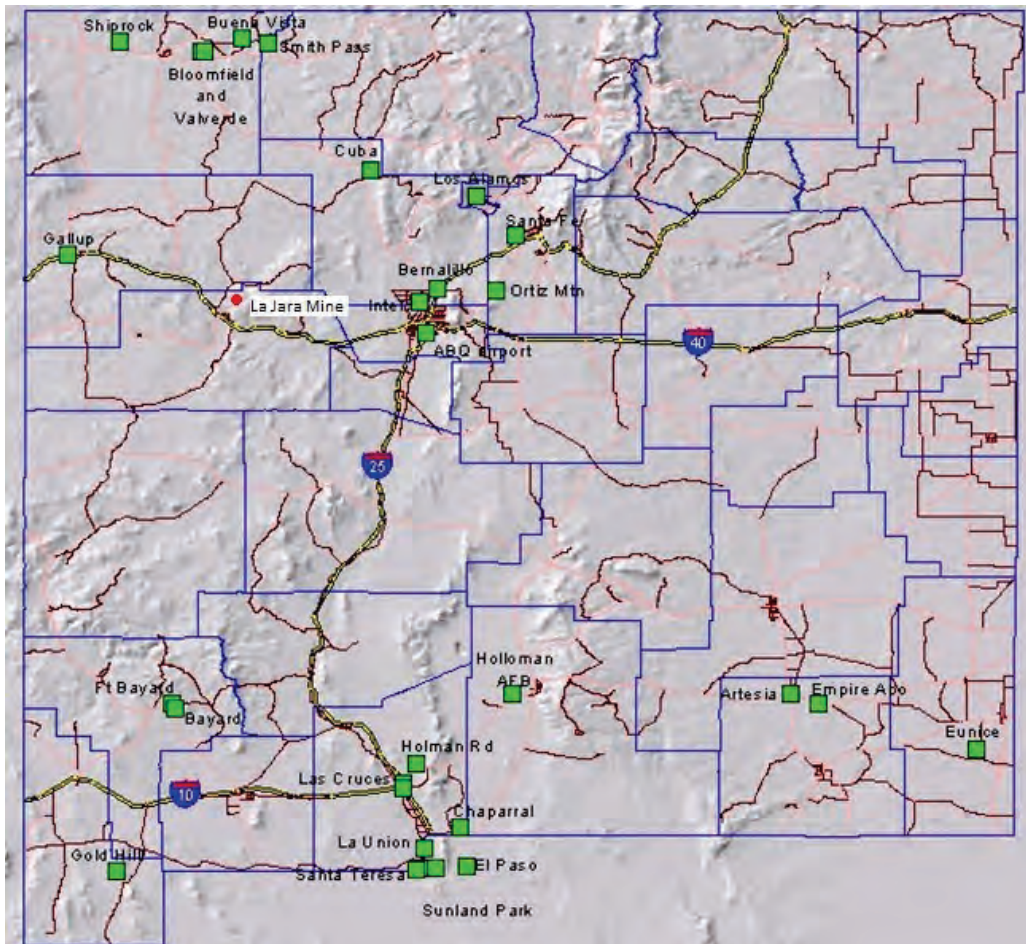


Figure 12. Ambient monitoring locations in New Mexico

Source: New Mexico Environment Department Website
<http://www.nmenv.state.nm.us/aqb/modeling/metdata.html>

As shown in figure 13, the primary source of carbon monoxide emissions is on-road vehicle exhaust. This is also true for NO_x and VOC emissions, shown in figures 14 and 15, respectively. Figures 16 and 17 show the emission levels of PM₁₀ and PM_{2.5} in Cibola County as of 2002. Road dust accounts for the vast majority of particulate emissions as the dry climate contributes to unmitigated release of road dust that is suspended by travel on both paved and unpaved roads. As of the 2002 inventory, Cibola County had higher emissions of particulates than any other pollutant due to the fugitive dust emissions of the county and low level of industrial emission sources.

Figures 18 and 19 display the emission levels and sources of SO₂ and Pb emissions for Cibola County. Neither of these pollutants is emitted in substantial quantities due to the lack of industrial and commercial combustion sources in Cibola County.

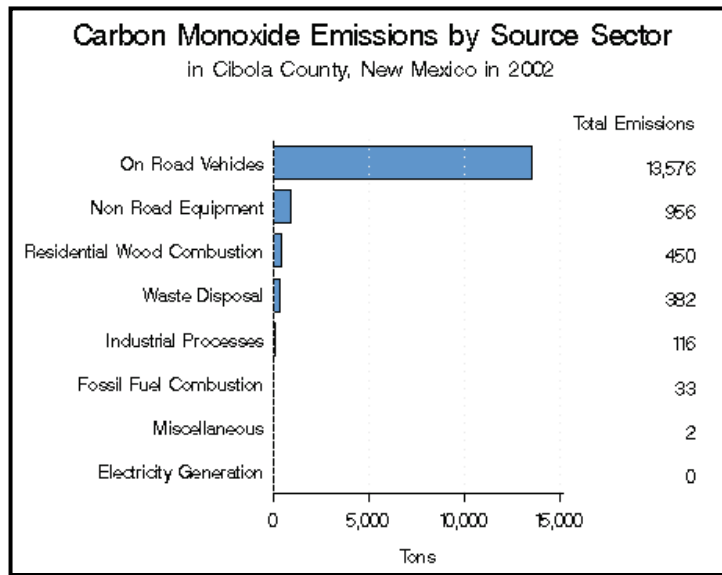


Figure 13. Emission sources of carbon monoxide in Cibola County

Source: EPA Web site on September 19, 2009

http://www.epa.gov/cgi-bin/broker?_service=data&_debug=0&_program=dataprog.dw_d_o_all_emis.sas&pol=225&stfips=35

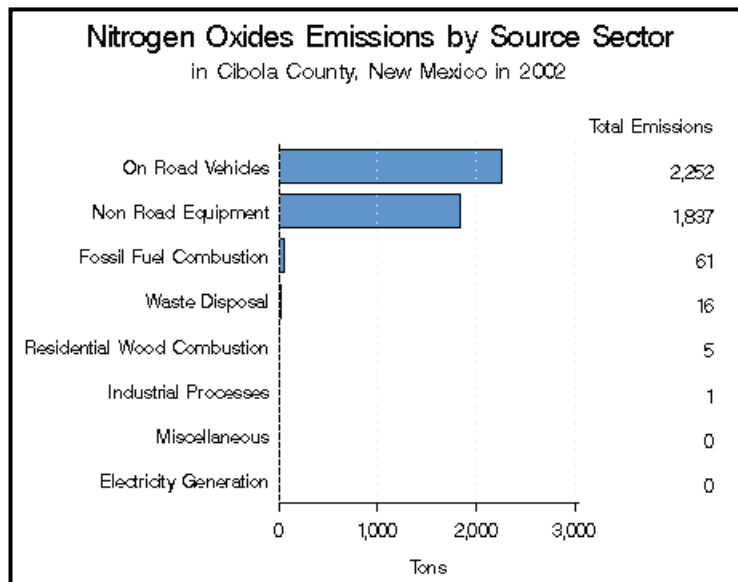


Figure 14. Emission sources of nitrogen oxides in Cibola County

Source: EPA Web site on September 19, 2009

http://www.epa.gov/cgi-bin/broker?_service=data&_debug=0&_program=dataprog.dw_d_o_all_emis.sas&pol=227&stfips=35

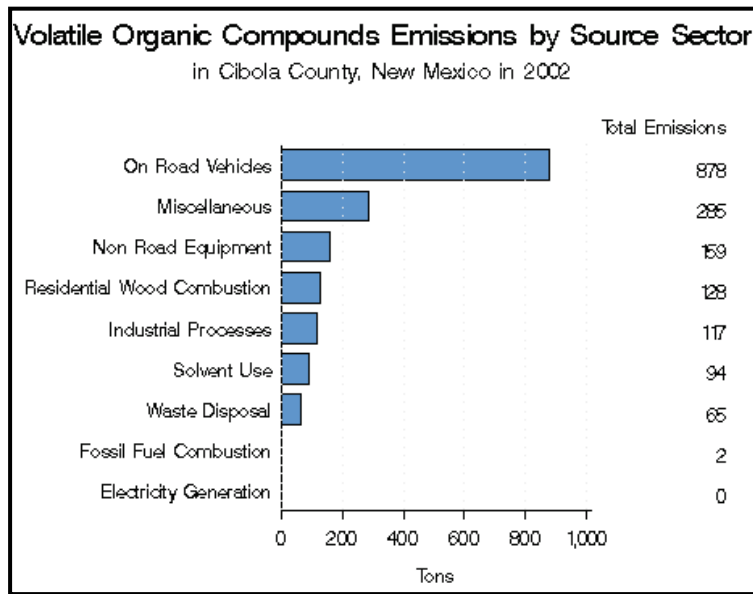


Figure 15. Emission sources of volatile organic compounds in Cibola County

Source: EPA Web site on September 19, 2009

http://www.epa.gov/cgi-bin/broker?_service=data&_debug=0&_program=dataprog.dw_d_o_all_emis.sas&pol=229&stfips=35

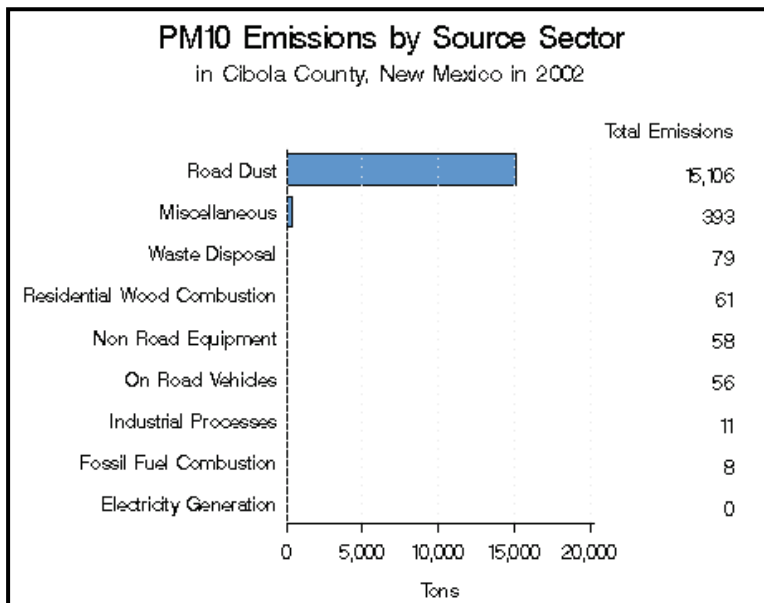


Figure 16. Emission sources of PM₁₀ in Cibola County

Source: EPA Web site on September 19, 2009

http://www.epa.gov/cgi-bin/broker?_service=data&_debug=0&_program=dataprog.dw_do_all_emis.sas&pol=230&stfips=35

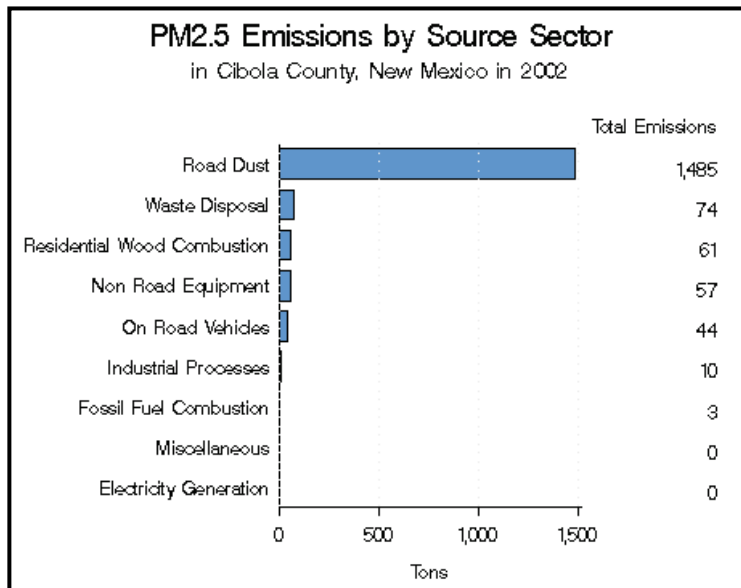


Figure 17. Emission sources of PM_{2.5} in Cibola County

Source: EPA Web site on September 19, 2009

http://www.epa.gov/cgi-bin/broker?_service=data&_debug=0&_program=dataprog.dw_do_all_emis.sas&pol=231&stfips=35

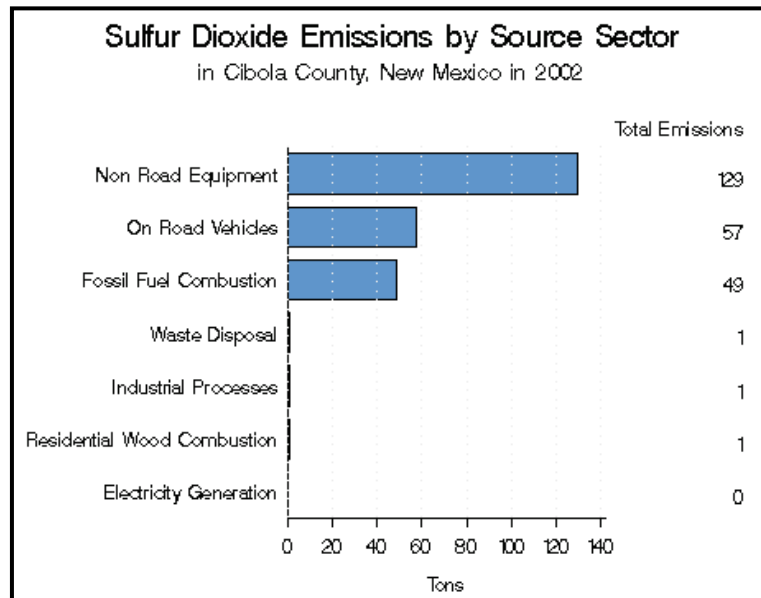


Figure 18. Emission sources of SO₂ in Cibola County

Source: EPA Web site on September 19, 2009

http://www.epa.gov/cgi-bin/broker?_service=data&_debug=0&_program=dataprog.dw_do_all_emis.sas&pol=228&stfips=35

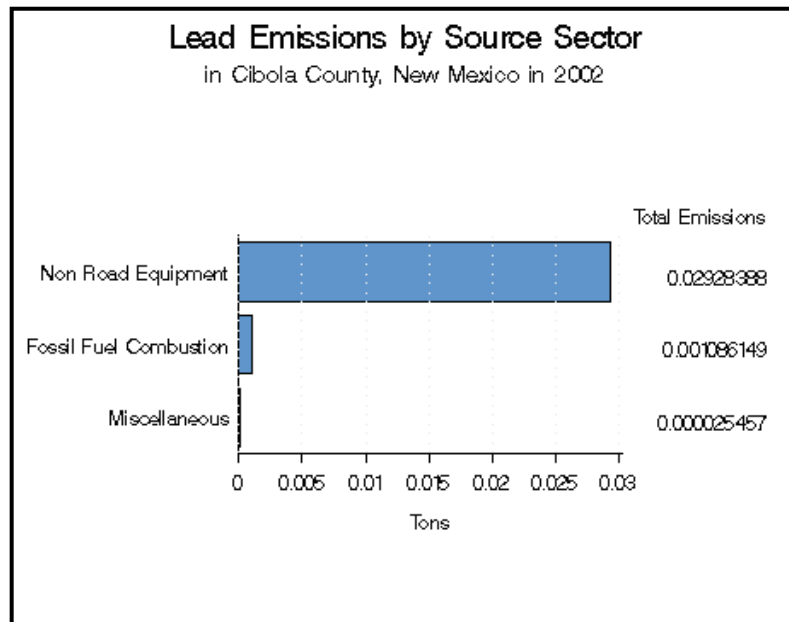


Figure 19. Emission sources of lead in Cibola County

Source: EPA Web site on September 19, 2009

[http://www.epa.gov/cgi-](http://www.epa.gov/cgi-bin/broker?_service=data&_debug=0&_program=dataprog.dw_do_al)

[bin/broker?_service=data&_debug=0&_program=dataprog.dw_do_al](http://www.epa.gov/cgi-bin/broker?_service=data&_debug=0&_program=dataprog.dw_do_al)

[l_emis.sas&pol=219&stfips=35](http://www.epa.gov/cgi-bin/broker?_service=data&_debug=0&_program=dataprog.dw_do_al)

The Western Regional Air Partnership (WRAP) has developed projections for emissions in New Mexico that extrapolate from the 2002 National Emissions Inventory based on projected growth, impacts of regulation, and impacts of changing technologies to the extent that those impacts can be estimated (see table 13). The result is that point source emissions would likely show decreases in emissions of NO_x and particulate matter due to regulations and improved technology.

However, particulate matter from area sources, such as roads and storage piles, is projected to increase.

Table 13. Projected change in New Mexico statewide emission inventory from 2002 to 2018 for point and area source emissions

Source Type	Inventory Year	Particulate Emissions in Tons/Year						
		NO _x	SO ₂	VOC	CO	PM ₁₀	PM _{2.5}	NH ₃
Point	2002	100,352	37,436	17,574	36,589	3,826	2,678	75
	2018	74,874	40,825	26,187	57,506	3,392	1,749	123
	Change	(25,478)	3,389	8,613	20,917	(434)	(929)	48
Area	2002	85,576	6,559	219,124	37,284	109,381	26,626	636
	2018	172,319	15,753	399,205	47,997	144,289	34,664	910
	Change	86,743	9,194	180,081	10,713	34,908	8,038	274

Source: WRAP (Western Regional Air Partnership) Point and Area Source Emissions Projections for the 2018 Base Case Inventory, Version 1, Prepared by Eastern Research Group, Inc., January 25, 2006.

Criteria Air Pollutants

Certain air pollutants have been recognized to cause health problems and damage to the environment, either directly or in reactions with other pollutants due to their presence in elevated concentrations in the atmosphere. Such pollutants have been identified and regulated as part of the overall endeavor to prevent further deterioration and facilitate improvement in regional air quality.

Criteria air pollutants, for which Federal and State ambient air quality standards have been promulgated, include CO, O₃, NO₂, SO₂, TSP, PM₁₀, PM_{2.5}, TRS, H₂S, and Pb. As discussed further under “Environmental Consequences,” the proposed project is expected to emit or result in the formation of only CO, O₃, NO₂, SO₂, TSP, PM₁₀, and PM_{2.5}, primarily from dust generation and vehicle/equipment exhaust. In addition, Federal hazardous air pollutants and State listed toxic air pollutants are also of concern in New Mexico. Each of these is briefly described below.

Carbon Monoxide

Carbon monoxide (CO) is an odorless, colorless gas formed by the incomplete combustion of fuels. The single largest source of CO is the motor vehicle. Emissions are highest during cold starts, hard acceleration, stop-and-go driving, and when a vehicle is moving at low speeds—all times of reduced combustion efficiency. New findings indicate that CO emissions per mile are lowest at about 45 mph for the average light duty motor vehicle and begin to increase again at higher speeds. This is tied to engine efficiency which can be lower at very low speeds when engines and transmissions are not operating at optimum design speeds, and again at high speeds, when fuel consumption increases as friction from engine operation, tires, and air resistance reduces efficiencies.

When inhaled at high concentrations, CO combines with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood. This results in reduced oxygen reaching the brain, heart, and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease or anemia, as well as fetuses. Healthy people exposed to high CO concentrations can experience headaches, dizziness, fatigue, unconsciousness, and even death. Such concentrations occur in enclosed spaces containing combustion products and are not found outdoors during normal conditions.

Ozone

Ozone (O₃) is not emitted directly into the environment, but is formed in the atmosphere by complex chemical reactions between NO_x and VOCs in the presence of sunlight. O₃ formation is greatest on warm, windless, sunny days. The main sources of NO_x and VOCs, often referred to as ozone precursors, are combustion processes (including motor vehicle engines) and the evaporation of solvents, paints, and fuels. As with CO, automobiles are the single largest source of ozone precursors. Tailpipe emissions of reactive organic gases (ROG) are emitted similarly to CO and are highest during cold starts, hard acceleration, stop-and-go conditions, and slow speeds. Traffic is more of a diffuse source but higher concentrations may be found in cities and near congested freeways. O₃ is also created by lightning, which converts the O₂ in the air (oxygen) to O₃.

Ozone levels usually build up during the day and peak in the afternoon hours. Short-term exposure can irritate the eyes and cause constriction of the airways. Besides causing shortness of

breath, it can aggravate existing respiratory diseases such as asthma, bronchitis, and emphysema. Chronic exposure to high O₃ levels can permanently damage lung tissue, plants and trees, and materials such as rubber and fabrics.

Nitrogen Dioxide

Nitrogen dioxide (NO₂) is a reddish brown gas that is a byproduct of combustion processes. Automobiles and industrial operations are the main sources of NO₂. Aside from its contribution to ozone formation, NO₂ can increase the risk of acute and chronic respiratory disease and reduce visibility. NO₂ may be visible as a coloring component of a brown cloud on high pollution days, especially in conjunction with high O₃ levels. The only sources of NO₂ for the proposed project are the diesel generators and mobile sources burning gasoline or diesel fuel.

Sulfur Dioxide

Sulfur dioxide (SO₂) is a colorless acid gas with a strong odor that is produced by the combustion of sulfur-containing fuels such as oil, coal, and diesel. It has the potential to damage materials and can have health effects, contributing to respiratory illness particularly in children and the elderly, and aggravating existing heart and lung diseases. SO₂ can irritate lung tissue and increase the risk of acute and chronic respiratory disease.

SO₂ in the presence of a catalyst such as NO₂ can form sulfuric acid (H₂SO₄) in the atmosphere, resulting in acid rain which damages trees, crops, historic buildings, and monuments and makes soils, lakes, and streams acidic. SO₂ also contributes to the formation of atmospheric particles that impair visibility. SO₂ and the pollutants formed from SO₂, such as sulfate particles, can be transported over long distances and deposited far from the point of origin. This means that problems with SO₂ are not confined to areas where it is emitted. The only sources of SO₂ for the proposed project would be diesel generators and mobile sources.

Particulate Matter

Total suspended particulate (TSP) is regulated only by the State of New Mexico. It is regulated because it can contribute to visibility degradation. According to EPA, “A primary pollutant of concern at mining sites is particulate matter. In many of the processes associated with mining activities, a significant portion of the mass of particulate matter is made up of large particles, those with diameters greater than 10 microns. This coarse particulate matter usually settles gravitationally within a few hundred meters of the source (EPA 1994).”

Particulate matter 10 microns or less in aerodynamic diameter and 2.5 microns or less in diameter (PM₁₀ and PM_{2.5}) refer to a wide range of solid or liquid particles in the atmosphere, including smoke, dust, aerosols, and metallic oxides. Some particulate matter, such as pollen, is naturally occurring. However, most particulate matter is caused by combustion, construction, grading, demolition, agricultural activities, and motor vehicles. Extended exposure to particulate matter can increase the risk of chronic respiratory disease. Inhalable coarse particles, such as those found near roadways and dusty industries, are larger than PM_{2.5} and typically smaller than PM₁₀. Fine particles (PM_{2.5}), as defined by the EPA, include smoke and haze and are a subset of PM₁₀. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from combustion equipment, industries, and automobiles react in the air.

PM₁₀, which includes PM_{2.5}, is of concern because it bypasses the body's natural filtration system more easily than larger particles, and can lodge deep in the lungs. PM_{2.5} is so small it behaves much like a gas and can bypass all of the human body's defenses to reach the deepest portions of the lungs where oxygen is absorbed. Thus, EPA revised their particulate matter standards several years ago to apply only to these particle sizes.

As with CO and ozone precursors, motor vehicles constitute the single largest source of PM₁₀ based on the best available data. Motor vehicles produce particulates through direct tailpipe emissions of particulate matter; direct emissions of NO_x, which become particulate ammonium nitrate in the atmosphere; and the suspension of road dust by tires. Vehicles also produce PM₁₀ from brake pad and tire wear.

Re-suspended road dust has not been reduced by improvements in motor vehicle air pollution controls. In fact, road dust is expected to continue to increase unless there is a reduction in motor vehicle use and broader adoption of dust control measures. Dust control measures may be needed at construction sites, unpaved roads and parking lots, agricultural, and other area sources that emit dust directly into the ambient air and/or convey mud and dirt to roadways.

High levels of particulates have also been known to exacerbate chronic respiratory ailments, such as bronchitis and asthma, and have been associated with increased emergency room visits and hospital admissions. PM_{2.5} is the primary cause of reduced visibility (haze) in parts of the U.S., including many of the national parks and wilderness areas. Particles can be carried over long distances by wind and then settle on ground or water. The effects of this settling include: making lakes and streams acidic; changing the nutrient balance in coastal waters and large river basins; depleting the nutrients in soil and damaging sensitive forests and farm crops; and affecting the diversity of ecosystems. Particle pollution can stain and damage stone and other materials, including culturally important objects such as statues and monuments.

Federal Hazardous Air Pollutants and New Mexico Toxic Air Pollutants

The primary hazardous air pollutants (HAPs) and toxic air pollutants (TAPs) of concern for the proposed project are naturally occurring uranium, radium, and radon. Mineralized ore containing uranium and radium would be mined for offsite processing into potential fuel or other products. Radiation exposure would be possible from these elements.

Radiation refers to energy emitted in the form of waves or particles. There are two main types of radiation which must be considered: nonionizing radiation and ionizing radiation. Nonionizing radiation occurs at the low frequency end of the electromagnetic spectrum. Examples of nonionizing radiation include microwaves, radio waves, radar, infrared, and some ultraviolet radiation. This type of radiation in sufficient concentration can produce undesirable effects on humans through heating. As the frequency increases through the ultraviolet region, the energy from the electromagnetic radiation becomes sufficient to release orbiting electrons from the surrounding matter. This form of radiation is ionizing radiation. Examples of ionizing radiation are x-rays, gamma rays, and cosmic rays. In addition to wave or frequency type radiation emissions, several particles are also included in this form of radiation, referred to as alpha particles and beta particles. The form of radiation of concern at the proposed La Jara Mesa Mine is ionizing radiation.

The negative health effects attributed to this type of radiation depend on many parameters including the amount of radiation received (dose), the rate at which the radiation is delivered

(dose rate), and the type of ionizing radiation (alpha, beta, x-ray, gamma). The ionizing radiation which would be present at the La Jara Mesa Mine site would include x-rays, gamma rays, alpha particles, and beta particles. These types of radiation are emitted from the radioactive material found in and around the uranium ore. X-rays and gamma radiation have no mass or charge. They may be produced by x-ray machines, by ionization of atoms or molecules, or by the decay of radioactive atoms. Beta particles have a very small mass and a negative charge. Beta particles are electrons which have been released from inside an atom as that atom decays and seeks a more stable configuration. Alpha particles do not travel far and cannot penetrate clothing, skin, or even paper, and are a risk only if inhaled.

The natural radiation environment consists of cosmic radiation and many radioactive elements, including Hydrogen-3, Carbon-14, Potassium-40, Rubidium-87, Uranium-235, Uranium-238, and Thorium-232. Both Uranium-238 and Thorium-232 are ubiquitous in soil with average concentrations of a few parts per million. Each is a parent element of a radioactive decay series. The parents decay to daughters which are also radioactive. Natural uranium is about 99.3 percent U-238.

When ionizing radiation deposits energy in living matter, it produces a physical and biological effect which may be quantified in terms of dose. The dose to a particular receptor of radiation is expressed in radiological units, known as rems (roentgen equivalent man). However, because this unit is so large compared to background and most exposure levels it is often useful to divide the value by 1,000 and call it millirem (mrem). A progeny of U-238 is Radon-222. Radon is a colorless, odorless, and inert gas which diffuses into the atmosphere from rocks, soil, and building materials. It is found in many places in the natural environment and typically in higher concentrations in unventilated spaces such as basements, mines, and other enclosed areas. All the radon progeny are particulates and many decay by emitting alpha particles. It is the alpha particle emitting progeny of Radon-222 that have been linked to negative effects on humans. Radon gas emanates from the earthen materials containing uranium such as natural soil and ore stockpiles. If airborne, the gas would be transported by prevailing winds and would decay to its progeny. A health effects analysis of radon gas emissions is included in the “Health and Safety” section.

Air Quality Standards and Regulations

Air quality within the region is addressed through the efforts of various Federal, State, regional, and local government agencies. These agencies work jointly, as well as individually, to improve air quality through legislation, regulations, planning, policy making, education, and a variety of programs. The air pollutants of concern, pertinent regulations, and agencies primarily responsible for improving air quality are discussed below.

Federal

The Federal Clean Air Act (FCAA) requires the EPA to identify National Ambient Air Quality Standards (NAAQS) and National Emission Standards for Hazardous Air Pollutants (NESHAPs) to protect public health and welfare. National standards have been established for the criteria air pollutants ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, PM₁₀, PM_{2.5}, and lead. To ensure that ambient air quality standards are met, the EPA has also promulgated a number of New Source Performance Standards (NSPS).

The FCAA has provisions that require each state to prepare an air quality control plan referred to as the state implementation plan (SIP). The SIP is prepared by individual State, regional, or tribal authorities to describe how they would implement the requirements of the FCAA. States with an approved SIP are authorized by the EPA to act as the regulatory authority for those portions of the SIP that have been approved. The State of New Mexico has an approved SIP.

States containing areas that violate the NAAQS are required to revise their SIP to incorporate additional control measures to reduce air pollution. The SIP is periodically modified to reflect the latest emissions inventories, planning documents, and rules and regulations of air basins as reported by the agencies with jurisdiction over them. The EPA reviews all SIPs to determine if they conform to the mandates of the FCAA and would achieve air quality goals when implemented. If the EPA determines a SIP to be inadequate, it can prepare a federal implementation plan (FIP). Failure to submit an approvable SIP or to implement the plan within mandated timeframes can result in sanctions being applied to transportation funding and stationary air pollution sources in the air basin.

NESHAPs that would apply to construction/operations at the La Jara Mesa Mine include the following:

- Title 40 Part 61 Subpart B of the Code of Federal Regulations – National Emission Standards for Radon Emissions From Underground Uranium Mines (Note: this regulation is still administered by the EPA although the State of New Mexico is delegated to implement the majority of the Federal NESHAPS)
- Title 40 Part 63 Subpart CCCCCC of the Code of Federal Regulations – National Emission Standards for Hazardous Air Pollutants for Source Category: Gasoline Dispensing Facilities

Tribal

EPA Region 9 has delegated air permitting authority under Part 71 of the Clean Air Act to the Navajo Tribe, including Title V permitting, but excluding permitting authority over the Four Corners power plant project or the Navajo Generating Station. Such delegation has no effect on the La Jara Mesa Project.

State

The mission of the New Mexico Environment Department's Air Quality Bureau (AQB) is to protect the inhabitants and environment of New Mexico by preventing the deterioration of air quality through the following:

- Strategic planning to ensure that all air quality standards are met and maintained.
- Issuing air quality construction and operating permits.
- Enforcing air quality regulations and permit conditions.

The AQB has authority over air quality in all New Mexico counties except Bernalillo County, but does not have authority to regulate facilities on tribal lands. The AQB has primary responsibility to enforce Federal regulations and issue construction and operating permits, but may also develop and enforce regulations that are more stringent than Federal standards. For example, the State of

New Mexico has additional ambient air quality standards that are more restrictive than the NAAQS.

Table 14 shows a comparison of State and Federal AAQS from the New Mexico Air Quality Bureau, NMED, and from the Clean Air Act, 42CFR, 85 respectively.

The State of New Mexico has developed air quality rules and regulations codified in the New Mexico Administrative Code (Title 20) that would apply to the proposed La Jara Mesa Project. Among these regulations are restrictions on visible emissions and the requirement to obtain a construction permit for certain types of sources and emission levels. Sources of uranium emissions and other toxic air contaminants are required to obtain a construction permit. Additionally, sources for which there are applicable NSPS or NESHAPs are required to obtain a construction permit, and sources with the potential to emit greater than 10 pounds/hour or 25 tons/year of any regulated air contaminant for which there is a New Mexico or National AAQS are required to obtain a construction permit.

Table 14. New Mexico and Federal ambient air quality standards

Pollutant	Averaging Time	New Mexico	Federal Standards		
		Concentration	Primary		Secondary
Carbon Monoxide (CO)	8 Hour	8.7 ppm	9 ppm (10 mg/m ³)	[1]	--
	1 Hour	13.1 ppm	35 ppm (40 mg/m ³)		
Ozone (O ₃)	1 Hour	--	--	[2]	Same as Primary Standard
	8 Hour	--	0.075 ppm	[3]	
Respirable Particulate Matter (PM ₁₀)	24 Hour	--	150 µg/m ³	[4]	Same as Primary Standard
Fine Particulate Matter (PM _{2.5})	24 Hour	--	35 µg/m ³	[5], [6]	Same as Primary Standard
	Annual Arithmetic Mean	--	15.0 µg/m ³		
Total Particulate Matter (TSP)	24 Hour	150 µg/m ³	No Federal Standards		
	7 Day	110 µg/m ³			
	30 Day	90 µg/m ³			
	Annual Geometric Mean	60 µg/m ³			
Nitrogen Dioxide (NO ₂)	Annual Arithmetic Mean	0.05 ppm	0.053 ppm (100 µg/m ³)		Same as Primary Standard
	24 Hour	0.10 ppm	--		
	1 Hour	--	100 ppb	[7]	--
Sulfur Dioxide (SO ₂)	Annual Arithmetic Mean	0.02 ppm	0.030 ppm (80 µg/m ³)		--
	24 Hour	0.10 ppm	0.14 ppm (365 µg/m ³)		--

Pollutant	Averaging Time	New Mexico	Federal Standards		
		Concentration	Primary		Secondary
	3 Hour	--	--		0.5 ppm (1300 µg/m³)
	1 Hour	--	75 ppb	[8]	
Lead (Pb)	Calendar Quarter	--	1.5 µg/m³	[9]	Same as Primary Standard
	Rolling 3-Month Average	--	0.15 µg/m³		
Total Reduced Sulfur (TRS)	½ Hour	0.003 ppm	No Federal Standards		
Hydrogen Sulfide (H₂S)	1 Hour	0.010 ppm			

Source: U.S. EPA and New Mexico DEQ as of November 3, 2010

[1] Not to be exceeded more than once per year.

[2] (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1.

(b) As of June 15, 2005, EPA has revoked the 1-hour ozone standard in all areas except the fourteen 8-hour ozone nonattainment Early Action Compact (EAC) areas. For one of the 14 EAC areas (Denver, CO), the 1-hour standard was revoked on November 20, 2008. For the other 13 EAC areas, the 1-hour standard was revoked on April 15, 2009.

[3] To attain this standard, the 3-year average of the fourth highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective May 27, 2008).

[4] Not to be exceeded more than once per year on average over 3 years.

[5] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population oriented monitor within an area must not exceed 35 µg/m³ (effective December 17, 2006).

[6] To attain this standard, the 3-year average of the weighted annual mean PM_{2.5} concentrations from single or multiple community oriented monitors must not exceed 15.0 µg/m³.

[7] To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010).

[8] Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

[9] Final rule signed October 15, 2008.

Environmental Consequences

No Action Alternative

Under the no action alternative, the proposed La Jara Mesa Project and all associated infrastructure, including the surface facilities, water supply and pipeline, and access road improvements, would not be constructed. Recreational opportunities would still occur on the site, resulting in fugitive dust emissions from roadways. Recreational vehicle use, hunting, and ranching vehicle use would be less frequent than construction and operational traffic near the mine site, and no dust control measures would be in place.

Proposed Action Alternative

Construction

Phase 1 (underground development) would consist of a number of activities that have the potential to create air emissions. These activities include:

- **Drilling and blasting.** During incline and escape raise excavation, drilling and blasting would contribute short duration releases of nonmineralized fugitive dust. As needed, water would be used to control underground dust emissions.
- **Soil (growth medium) removal and storage.** Growth medium would be removed from the surface where waste rock, support, and portal equipment and buildings would be placed. A vegetative cover would be used to prevent surface erosion (windblown fugitive dust emissions) until the growth medium is needed for future reclamation activities.
- **Surface disturbance and roadway fugitive dust.** Approximately 16.4 acres of surface would be disturbed to create room for support facilities, waste rock placement, ore and growth medium storage, parking, equipment storage, vehicle parking, and an escape raise.
- **Mobile equipment exhaust (mining and surface construction).** Gasoline and diesel powered mobile equipment would be used for construction. Emissions would be generated from tailpipe exhaust. Vehicle exhaust emitted underground would be released with ventilation air. Emissions from vehicles on the surface would be distributed around the 16.4-acre disturbance area. Construction emissions are expected to have a minor impact on air quality due to the remote nature of the site, the limited number of vehicles, and the temporary nature of construction.
- **Backup electric generator exhaust.** Portable generators would be used for the initial portal site and underground development work. An emergency generator would be placed at the escape raise upon completion of that feature. Impacts of emissions on the environment and nearest residences are expected to be negligible due to the remote nature of the site relative to residences and the temporary nature of construction. Continental Divide Electric Cooperative, Inc., would supply electric service to the site during phase 2. This would eliminate the need for diesel generators except for backup power. The generators are expected to operate less than 200 hours per year in such a capacity. This would also reduce the number of fuel shipments to the site, which would eliminate the generation of some fugitive road dust and fuel delivery truck emissions.
- **Fuel and solvent filling, storage, and use.** Fuels would be stored in above ground storage tanks and would comply with any applicable fuel storage and fuel dispensing air quality regulations. Solvents used for maintenance/parts cleaning would be kept in closed containers when not in use.

Operation

Drilling and blasting would contribute short duration releases of mineralized and nonmineralized fugitive dust. As needed, water would be used to control underground dust emissions. As part of operations, mineralized rock would be brought to the surface and stored for transport to a processing facility. No crushing or processing would be conducted at the mine site. Ore that is transported to the surface is expected to be moist such that fugitive dust emissions from unloading onto the storage pile would be greatly diminished.

To reduce fugitive emissions generated at the surface, mined out areas below ground would be backfilled with waste rock. However, due to the expansion of the waste rock as it is mined, some waste rock would still be placed at the surface. Water spray would be used to mitigate dust emissions from disturbed areas of the surface where waste rock is placed.

- **Mobile equipment exhaust.** To the extent possible, electrically powered tools and equipment would be used for mining. Some mobile equipment powered by gasoline or diesel fuel would be used, resulting in some combustion emissions. Additionally, 12 to 13 ore trucks per day would be used to haul ore (500 tons/day) to a testing or processing facility. It is anticipated that mobile equipment exhaust would not have a significant impact due to the remote nature of the facility. The nearest downwind residence is approximately 3 miles away, allowing for emissions from the mine site to disperse.
- **Fuel and solvent filling, storage, and use.** Fuels would be stored in above ground storage tanks and would comply with any applicable fuel storage and fuel dispensing air quality regulations. Oils and lubricants would be stored in sealed drums and containers. Solvents used for maintenance/parts cleaning would be kept in closed containers when not in use.
- **Backup electric generator exhaust.** The facility would operate ventilation fans, compressors, and tools using electricity supplied to the site via power line. Diesel generators would only be used to provide backup power in the event of an outage. A diesel generator would be used to supply power to the escape raise pod in the event of an emergency. All generators would be kept in good working condition and would be run periodically to ensure they are functional if not being used. However, the generators would operate less than 200 hours/year individually. As such, these would be temporary emission sources for which there is expected to be no impact.
- **Disturbed surface wind erosion, paved and unpaved fugitive road dust.** Approximately 16.4 acres of surface would have been disturbed to create room for support facilities, waste rock placement, ore and growth medium storage, parking, equipment storage, vehicle parking, and an escape raise. Approximately 6.2 miles of existing unpaved roads, some of which would require improvement, would be used for access to the site from NM 605. During dry periods, a 3,000-gallon water truck would be used to apply approximately a full water load each hour for 5 to 8 hours per day. A water solution with magnesium chloride (MgCl) as a dust control measure may also be used to suppress dust from the access and haul roads. Other synthetic dust control products are also available (e.g., SOILTAC, Soilworks LLC). Vehicles on access roads would be limited to 35 miles per hour.

The growth medium from disturbed areas would be stockpiled. A vegetative cover would be sown on the surface of the growth medium to preserve it for future reclamation of the site and reduce fugitive dust emissions.

All mineralized ore would be stockpiled and shipped to a testing or processing facility.

- **Surface handling and transport of mineralized ore (dumping and loading operations).** The ore stockpile would be sprayed with water to minimize the amount of dust generated during loading operations. Water sprays would be applied only to the extent necessary to moisten the ore and ore pad area. A clay liner would be used under the ore stockpile to avoid runoff or seepage of water that has contacted the mineralized ore. Any loose material that drops onto the cab, bumpers, running boards, or other exterior surfaces would be removed and placed back on the ore pad prior to leaving the site. The

truck tailgate would be closed and a tarpaulin (or other suitable cover) would be placed over the entire load and adequately secured so that fine ore particles cannot be released to the environment during transport. Ore transport trucks would meet Federal and State standards for the transport of uranium ore including covering and labeling.

Reclamation

Reclamation of the project area includes both construction reclamation and final reclamation. Reclamation efforts on lands disturbed during the course of site development would include activities (such as growth medium removal, stockpiling, and stabilization) that are a prelude to final reclamation. Final reclamation activities would be implemented upon cessation of underground development and mining activities, if such commercial production is commenced. The areas to undergo final reclamation upon project closure would include the mine portals, the escape raise, surface facility areas, and the site access road (that are not needed for long-term land use purposes). The goal of reclamation is to return the site to a vegetation covered area consistent with the surrounding area so that the mine site is not an ongoing source of windblown dust emissions. The growth medium removed during mine development would be stockpiled and then reseeded to prevent wind or water caused erosion. Upon cessation of mining activities at the site, salvageable equipment and trailers would be moved to another project, sold, or properly disposed of offsite. Unsalvageable portions of any facilities, such as concrete pads, would be broken up and buried on site, or removed, subject to Forest Service approval. Growth medium would be placed over the disturbed surface and reseeded to mitigate the site as a source of windblown dust. This would also be completed for the escape raise after the opening has been suitably covered to prevent access.

During the course of reclamation activities, diesel powered machinery would be used. This includes graders, scrapers, loaders, and other material placement and stabilization devices. It is expected that exhaust emissions would have no significant impact offsite due to the temporary duration of construction activities and the remote location of the mine site.

Greenhouse Gas Emissions

The Forest Service has not determined that greenhouse gas (GHG) emissions are a significant issue for this EIS. However, the effect of GHG emissions on world climate is an important issue that has received increasing national and international attention in recent years. The effects of Federal decisions on GHG emissions has become a factor in NEPA analysis and in agency operations in the last few years, depending on the significance of the issue for any project.

On October 5, 2009, after the scoping process for this EIS, President Obama signed Executive Order (E.O.) 13514 (74 Federal Register 52117) to establish an integrated strategy toward sustainability in the Federal Government and to make reduction of GHG emissions a priority for Federal agencies. Among other provisions, E.O. 13514 requires agencies to “measure, report, and reduce their GHG emissions from direct and indirect activities.” Section 2 of E.O. 13514 establishes a timeline for Federal agencies to establish GHG reduction targets and report inventories. The guidance includes the establishment of a work group to set up reporting protocols and requirements, and is designed to quantify emissions over which the agency has direct and operational control. This order does not obligate the FS to inventory the emissions of projects or activities like the applicant’s proposed La Jara Mesa Mine Project, but is referenced here to document the government’s interest in this issue.

The CEQ has developed guidance on the treatment of GHGs in NEPA EISs and released a draft guidance document for review and comment on February 19, 2010. The guidance is in draft form and has no direct administrative applicability to the La Jara Mesa Project or to this EIS for the following reasons:

- It is in draft form and in the process of evaluation. Comments received during the 90-day comment period are being evaluated and the guidance is not final and not in effect.
- As proposed, it suggests that a quantitative GHG analysis of agency activities should be done if a proposed Federal action could reasonably be assumed to cause direct emissions of 25,000 metric tons (27,500 short tons) of carbon dioxide annually. This would not apply to the proposed project. This EIS projects operation emissions of approximately 5,000 (short) tons per year of CO₂.
- The guidance states that CEQ does not propose to make this guidance applicable to Federal land and resource management actions.

The guidance emphasizes the importance of scoping and significance in determining the level of appropriate analysis for an EIS, and concludes that “Emissions from many proposed Federal actions would not typically be expected to produce an environmental effect that would trigger or otherwise require a detailed discussion in an EIS.”

The guidance emphasizes the “rule of reason” in NEPA and states that agencies should ensure that they keep in proportion the extent to which they document their assessment of the effects of climate change. Although the Forest Service has not begun to revise its NEPA implementing regulations or otherwise adopt procedures to incorporate the draft CEQ guidance on GHG emissions, the forest supervisor has made the following determination on the level of analysis needed for greenhouse gas emissions for the La Jara Mesa Project:

The Forest Supervisor has concluded that GHG emissions from a mining project such as this are not a significant issue. It is not a manufacturing, processing, or thermal energy generating project requiring the combustion of fossil fuels for energy or processing; it has no industrial point source emissions during operation, and emissions are limited to transportation sources, such as commuting vehicles, uranium ore transport vehicles, and onsite ore handling vehicles. The project does not recover fossil fuels for eventual combustion and GHG release; it recovers uranium, which could potentially be used to generate electricity and displace or avoid such future combustion. For those reasons, a quantitative life cycle GHG analysis has not been done for this project. Instead, an estimate of annual vehicle emissions during mining operation is provided.

To provide some comparison between the relative contribution of CO₂ emissions (the primary GHG pollutant being emitted in the world) from the proposed project from mining activity, to the draft threshold reporting criteria (25,000 metric tons) and recognizing the uncertainty of actual start date, milling location, and operating conditions at the mine, an estimate of annual emissions was developed. Based on an assumption of 13 ore delivery trucks operating 365 days per year, to some potential mill approximately 150 miles away (the Blanding mill is 190 miles away; other potential mill options are much closer), and assuming 100 commuter vehicles travel 100 miles per day each, and an additional 13 local delivery trucks service the site, approximately 5,000 tons of CO₂ equivalent per year would be emitted from the site, or 20 percent of the amount suggested

for reporting and tracking under local guidelines. If the assumed mill distance were doubled, CO₂ emissions would still remain at less than 40 percent of the draft reportable criteria.

Cumulative Effects

Local Impacts

Existing air quality represents past and present sources and ambient conditions including natural windblown dust that contributes to particulate. The area of effect considered in the cumulative analysis includes the mine site and areas downwind in the prevailing wind direction. It also includes cumulative effects of additional ore processing at a mill, and evaluated impacts at the existing Blanding Utah site as an example.

There are no known major sources of air emissions in the vicinity of the proposed mine site. Another uranium mine is proposed approximately 8 miles north of the site and beyond the influence of any air emissions or impacts noted here except for GHG emissions which are global. Air emissions from the proposed mine may also contribute localized emissions to Mt. Taylor. The nearest known residence is 3 miles southeast of the mine site, with significant topographical features between the residence and the mine site. The nearest towns of Grants and Milan, New Mexico, are located approximately 10 miles southwest of the portal and support facility location. There are significant topographical features (such as Black Mesa) located between the mine portal location and Grants-Milan. There is no wind downslope from the mine portal location toward Grants-Milan (see figure 10).

Because the proposed project would meet applicable Federal and State air quality standards, the mine portal and its impacts would be remotely located, and mine air quality impacts would be mitigated, the proposed project would not contribute to any significant cumulative impacts.

Regional Impacts

For purposes of this EIS, it is assumed that the ore would be transported by truck to a Denison Mines processing facility (mill) located in Blanding, Utah, known as the White Mesa mill. This mill is currently capable of accepting the ore.

The airshed in which the Utah processing facility is located is currently in attainment of all Federal ambient air quality standards. The ore processing facility is not a major stationary source of emissions and, therefore, operates with an approval order rather than a Title V operating permit. Major sources for some criteria pollutants such NO_x are defined as those emitting 100 tons per year or more. The facility is also not a major source of HAPs and is, therefore, unaffected by Maximum Achievable Control Technology standards. Potential emissions from the ore processing facility under the maximum operating scenario are shown in table 15.

The ore processing facility operates a number of combustion devices fueled by propane, a relatively clean burning fuel, to support ore drying. The primary pollutant that is emitted during ore processing is particulate matter. Both baghouses and scrubbers are used at the facility to capture and control particulate matter. The facility is currently permitted to handle the volume of ore that would be delivered from La Jara Mesa and has emission limits for PM₁₀ found in Approval Order No. DAQE-AN0112050008-08, which was reviewed to prepare this section of the EIS. The air permit also includes requirements for fugitive dust control from access roads, ore handling, truck operation, and tailings storage areas. All major fuel sources must use propane instead of diesel or other higher emission fuels.

Table 15. Potential emissions from ore processing

Pollutant	Potential-to-emit (tons/year)
PM ₁₀	33.91
NO _x	39.61
SO ₂	2.91
CO	10.49
VOC	4.03
Hazardous air pollutants	0.66

Project related emissions would not increase above the permitted levels shown in table 15 nor would the facility require a new or modified permit to process the La Jara Mesa ore. As a result, there is no significant cumulative air quality impacts anticipated from the project.

Greenhouse gas emissions are not at a reportable level and, although they contribute to worldwide emissions, the use of the product from this mine (uranium) could significantly reduce fossil fuel emissions if it displaced such thermal sources (oil, gas, and coal).

Water

Affected Environment

Surface Water

The proposed La Jara Mesa Mine Project is located within the San Mateo Creek subbasin of the Rio San Jose Basin, in northern Cibola County, New Mexico. The Rio San Jose Basin is a western tributary basin to the Rio Grande Basin in northwestern New Mexico (Williams 1986). The location of the proposed project and its watershed is shown in figure 20. This figure shows the position of the proposed project relative to San Mateo Creek, the Rio San Jose, and the Rio San Jose Basin.

The project is located approximately 4 miles east of San Mateo Creek, which is drainage that originates north of La Jara Mesa. San Mateo Creek is perennial only in its upper headwater reaches, north of La Jara Mesa near the Village of San Mateo. Elevations of the San Mateo Creek watershed range from approximately 8,200 feet AMSL on the north flank of La Jara Mesa to approximately 6,550 feet at the confluence of San Mateo Creek and the Rio San Jose Ditch, about 2 miles north of Milan (USGS 1957 and 1995). At its nearest point to the site, San Mateo Creek is ephemeral (flowing only in response to significant precipitation events in the watershed). San Mateo Creek is not hydraulically connected to and would not be affected by pumping from any of the bedrock aquifers that may be used for water supply for the project.

There are no other perennial drainages on or near the mine site itself. The project is situated within a 2,658-acre catchment of an unnamed ephemeral wash. All surface water features within the proposed project area are ephemeral. The catchment and locations of the proposed mine permit boundary and operational footprint are shown in figure 20. Surface water originating on the project site in response to storm events drains in a westerly direction away from Mt. Taylor. Interpretation of aerial photography and United States Geologic Survey (USGS) 7.5 minute quad

topography, further supported by field observations, indicates there is no apparent hydraulic connection between the ephemeral drainage below the project site and San Mateo Creek 4 miles to the west. Approximately 2 miles below the project site below a private ranch road, the ephemeral drainage appears to terminate in a dune field immediately west of State Road 605, where numerous small depressions are indicated on the USGS quad (figure 20).

The field inspection of the valley in the vicinity of the ranch road (Golder 2010) confirmed the presence of the dune field west of the road and found no discernable bed and bank structures that would indicate an active channel or ordinary high water mark (OHWM). The OHWM is used to identify the lateral limits of non-wetland waters and is defined as “the line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, or the presence of litter and debris” (Lichvar and McColley 2008). In ephemeral channels of the arid west, low to moderate discharge events with a 5- to 10-year return intervals are closely associated with the formation of an OHWM. The watercourse conditions in the vicinity of the dune field do not have the physical characteristics of an OHWM, and it is unlikely that stormwater from the project site flows more than a mile from the project site. Channel-like features above the dune field also appear to be discontinuous both laterally and longitudinally.

Based on the available information described above, there does not appear to be a significant nexus that connects the ephemeral channel to a relatively permanent water body, thus the drainage is probably not a jurisdictional nonwetland Water of the United States. A formal request of the U.S. Army Corps of Engineers for a jurisdictional determination would be required to confirm whether or not the ephemeral drainage is jurisdictional under the Clean Water Act.

The small ephemeral channels in the proposed project area are steeply sloped and are generally in moderate to poor condition. Roads from early exploration activities are cut into the escarpment above the site and have altered drainage patterns by redirecting stormwater into undersized channels. In several locations, particularly higher in the watershed, the confined channels have become entrenched and cut into exposed bedrock. The incised channels have also cut deeply into the colluvial and eolian deposits at the base of the escarpment.

No data is known to exist on stormwater discharge quantity, quality, or sediment load characteristics of the surface water catchment that encompasses the proposed mine site. However, because the drainage from the operational areas of the project will be managed and prevented from leaving the site, and the drainages in the watershed are ephemeral and terminate prior to reaching San Mateo Creek, there would be little or no impact from the mining activities to the watershed.

Precipitation data for the area is available from the National Oceanic and Atmospheric Administration Western Regional Climate Center for the San Mateo weather station, located approximately 7.5 miles north of the project site on the north flank of La Jara Mesa. Based upon the available climatic data for the period of record 1961-2000, the average annual precipitation at the San Mateo station is 9.4 inches; approximately 60 percent of the annual total falls between June and September. Monthly precipitation average data from the San Mateo station is shown in figure 21.

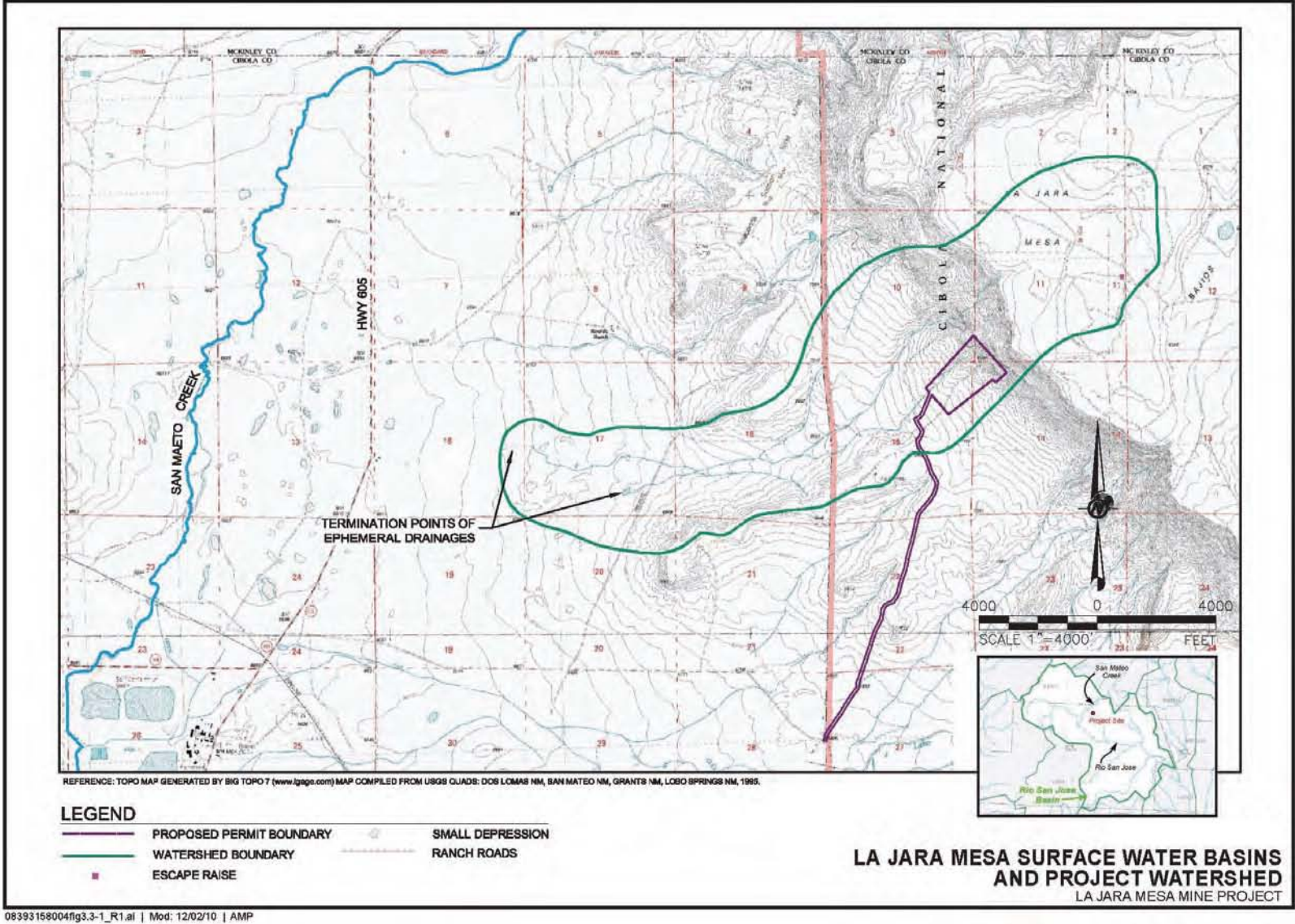


Figure 20. La Jara Mesa surface water basins and project watershed

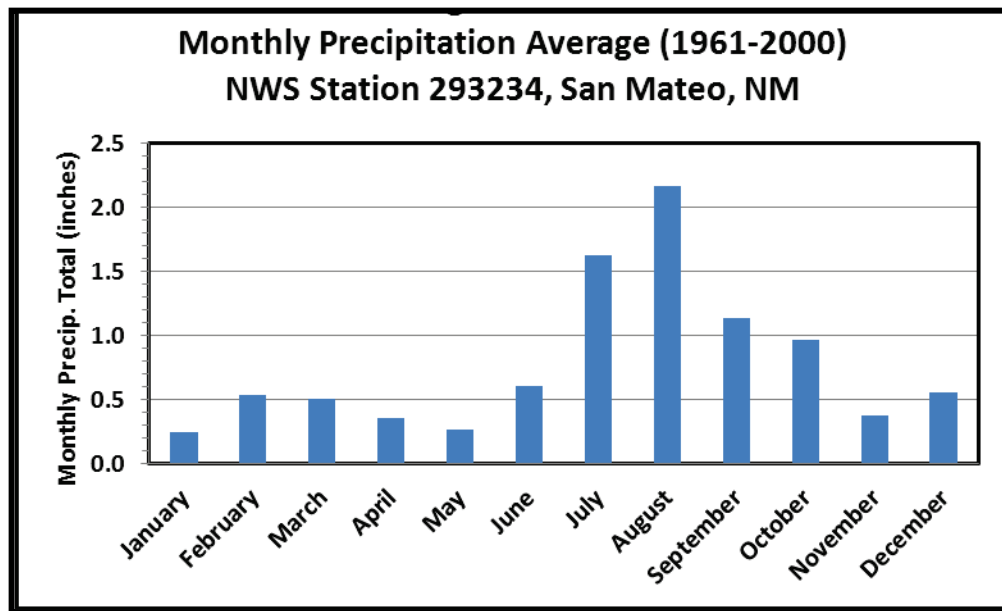


Figure 21. Precipitation summary NWS Station 293234, San Mateo, NM

High intensity, short-duration rains of limited areal extent are considered common in the project area during the summer months. Although infrequent, the magnitude, frequency, and areal extent of these intense rains can be important. The thunderstorm season is concentrated in July, August, and early September. High rainfall rates occur during the summer rainy season with a low chance of occurrence at any specific time and place. The stormwater flow events are expected to be associated with the infrequent storm events during an average year in the project area. Significant amounts of sediment are transported down the ephemeral washes during stormwater flow events. Based upon the sparse vegetation and lithology of bedrock substrates (toldito gypsiferous limestone and marine mudstones and sandstones) in the area, stormwater quality is expected to be impacted by sediment load and to be moderately mineralized. Sediment transport has been somewhat exacerbated by grazing and intermittent vehicle traffic on unimproved dirt roads in the immediate vicinity of the project site. Stormwater from the site does not reach San Mateo Creek.

Groundwater

Water Rights

Groundwater resources in the State of New Mexico are administered by the New Mexico Office of the State Engineer (NMOSE) under the Prior Appropriation Doctrine. The NMOSE delineates underground water basins and estimates groundwater resources available for appropriation in each basin. Groundwater appropriators establish underground water rights by filing claims for water use and perfecting the rights by applying the water to beneficial use. When underground water resources within a basin are fully committed to existing claims, the NMOSE declares the basin fully appropriated and no new water rights (except rights for individual domestic wells) are issued. During times of shortage, groundwater use could potentially be rationed, with those rights having the earliest priority dates (dates of initial documented beneficial use) receiving full portions first and rights having later priority dates sequentially receiving full portions based upon availability. Groundwater rights are defined by owner, purpose, and place of use and well location, but may be moved within a groundwater basin to allow transfer of ownership, well

location, or type of use. The project site is located in the Bluewater Underground Water Basin, which is a fully appropriated subbasin of the Middle Rio Grande Basin (figure 22).

Groundwater Resources – Hydrogeologic Conditions

Authoritative published investigations of groundwater and hydrogeologic conditions in the region of the project site have been prepared by Gordon (1961), Cooper and John (1968), Stone et al. (1983), and Baldwin and Rankin (1995); additional published papers, technical memoranda, and unpublished file data have also been developed by numerous workers. Thaden, Santos, and Ostling (1967a) mapped the surficial geology of the Dos Lomas 7½-minute quadrangle, which includes the La Jara Mesa Project. A portion of this map showing the locations and producing horizons of water wells in the area is included in figure 23. A hydrogeologic cross section was prepared using geologic map data and water well data developed by Stone et al. (1983), Gordon (1961) and the NMOSE (2009) and is shown in figure 24; the line of section for this cross section is shown on the geologic map in figure 23. Basic data on vicinity water wells developed by Gordon (1961) and from unpublished NMOSE file data (2009) are summarized in table 16.

Water bearing geologic units in the vicinity of the project include shallow Quaternary alluvial deposits, Entrada Sandstone, Sonsela Sandstone, or fractured shale zones of the Triassic Chinle Formation, and limestone and sandstone beds of the Permian San Andres Limestone and Glorieta Sandstone. With the exception of the alluvial deposits, wells in the vicinity of the La Jara Mesa Project produce water from each of these units.

Quaternary Alluvium: Several wells in the vicinity of the project are completed in unconsolidated alluvium; locations of these wells are shown on the geologic map in figure 23. No yield or water quality data is available for these wells; however, depths are 100 feet or less. These units are expected to be generally limited spatially to the drainage areas and have thin saturated thicknesses, which would not provide a reliable supply of water. Water in these deposits is also expected to be ephemeral.

Todilto Limestone: There are no wells in the area that produce water from the Todilto Limestone, which underlies the project site. The Todilto in the area of the project is about 16 feet thick and composed largely of lime mudstone and gypsiferous limestone reef deposits. In some areas this unit hosts uranium mineralization. The unit overlies the Entrada Sandstone.

Entrada Sandstone Aquifer: The shallowest source of potentially reliable groundwater supply is in the Entrada Sandstone west and southwest of the project site. The Elkins well (New Mexico Office of the State Engineer file number B-1272), which is at the proposed project well location, is completed in the Entrada Sandstone aquifer (Well B-1272, table 16 and Shomaker 2009a and 2009b). This well is located approximately 3 miles southwest of the project site in Section 28 of Township 12 North, Range 10 East. The well was pump tested and the yield from the well appeared to be insufficient for project needs (Shomaker 2009a).

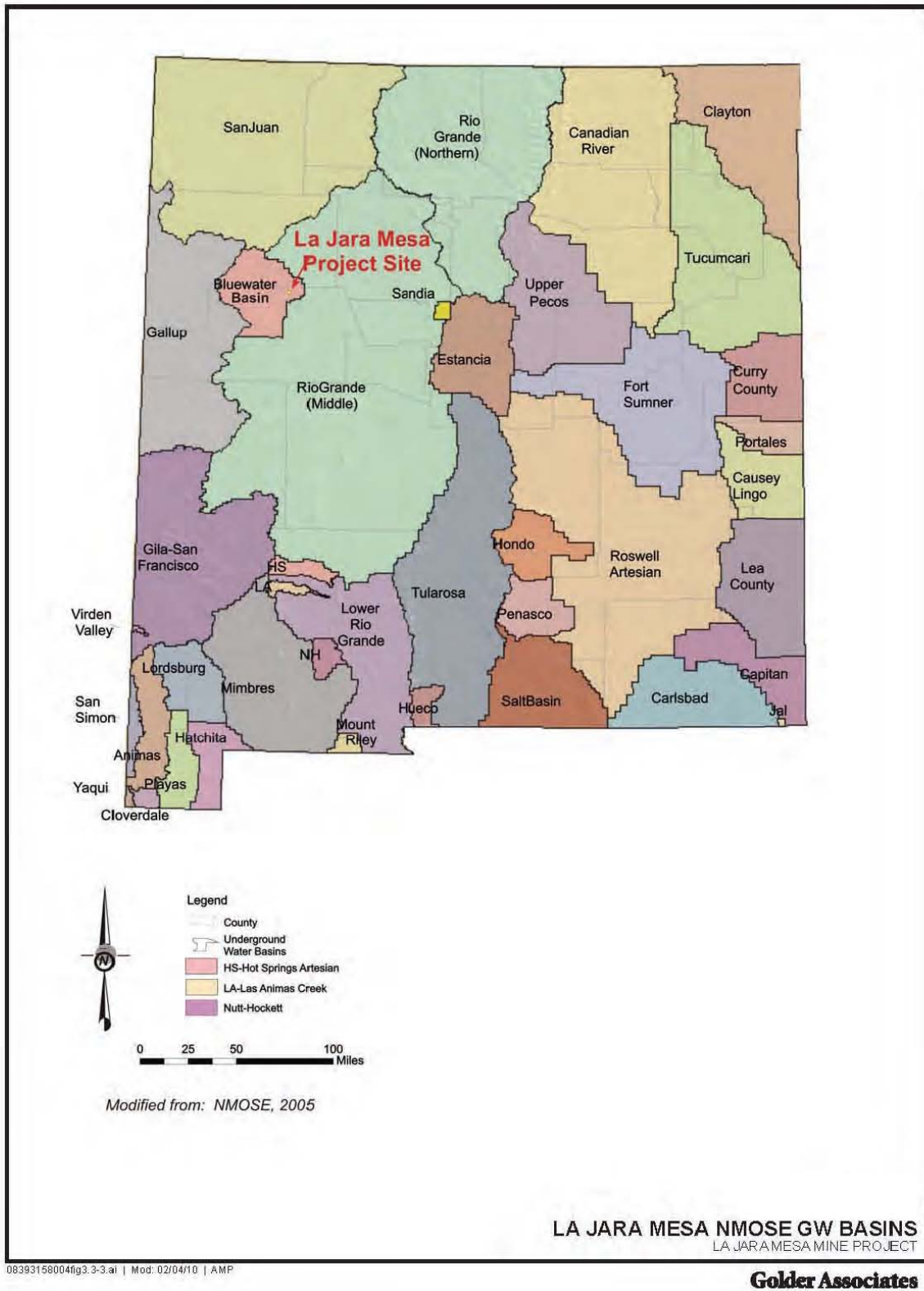
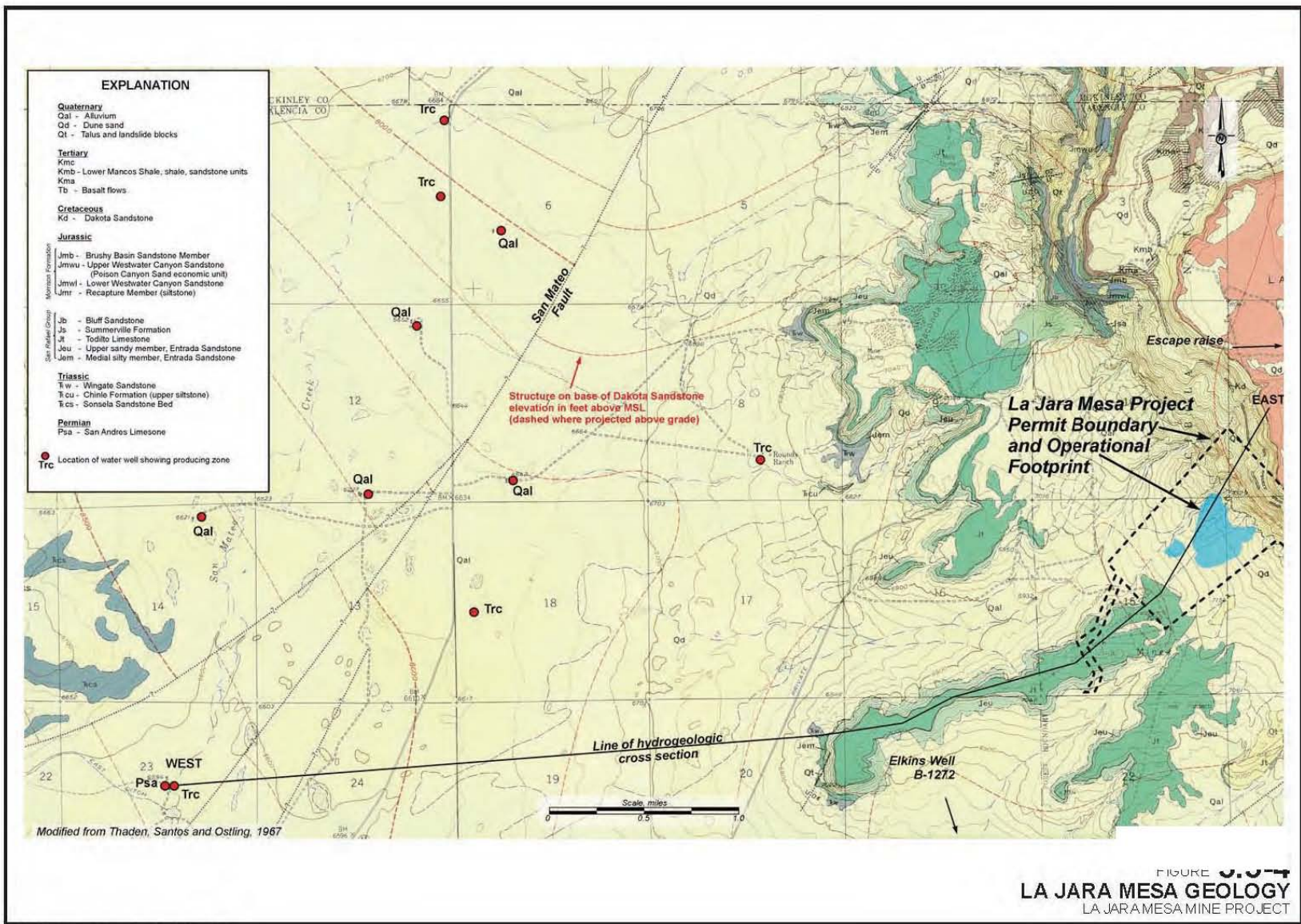


Figure 22. NMOSE groundwater basins



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Figure 23. La Jara Mesa geology

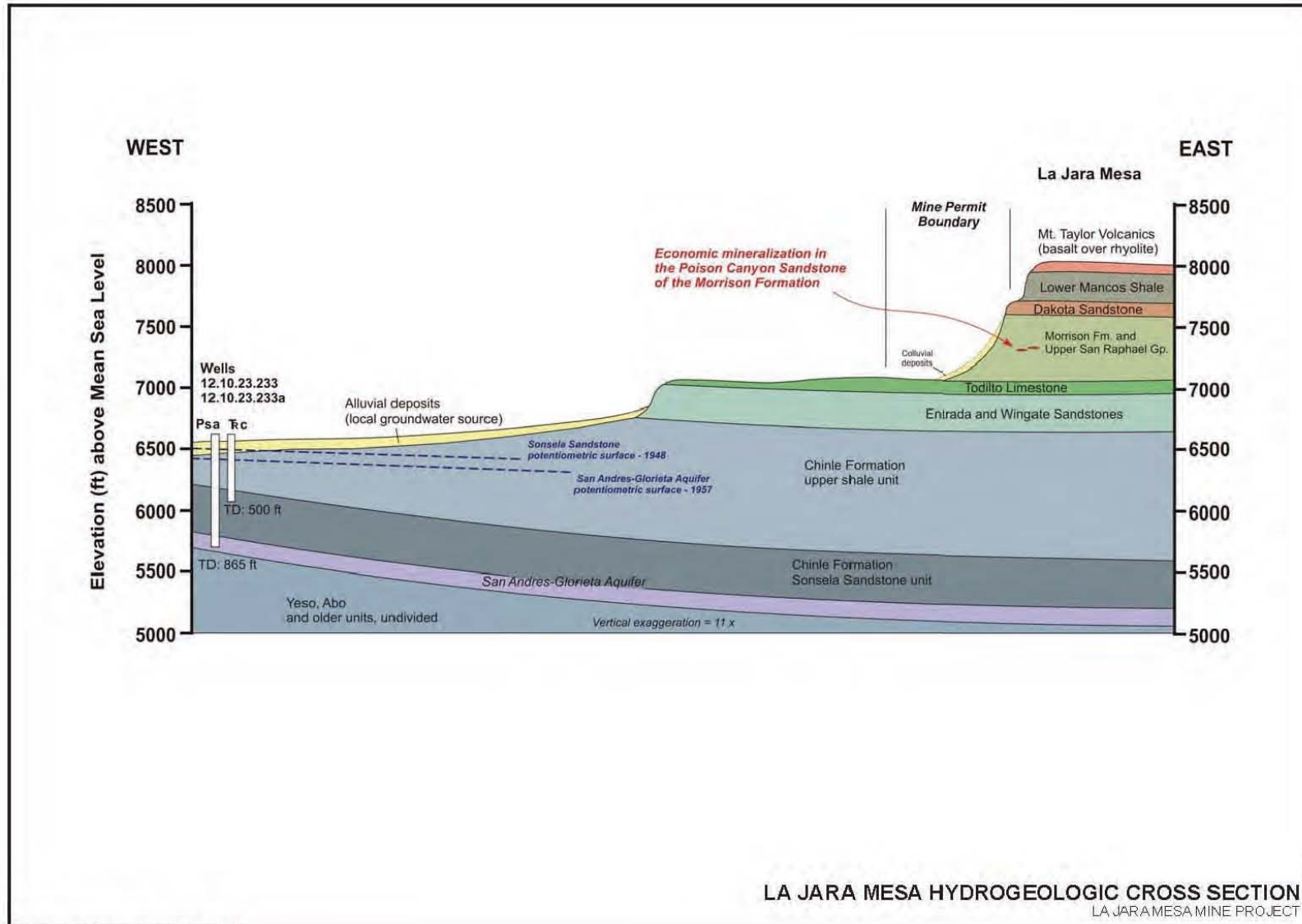


Figure 24. Hydrogeologic cross section

Table 16. Records of wells in the vicinity of the La Jara Mesa Mine Project

Location¹	Latitude-Longitude	Number or Name	Total Depth (feet)	Altitude (feet)	Depth to Water (feet)	Date Depth Measured	Principal water-bearing unit(s)	Specific Conductance (umhos at 25° C)	Date SC measured	Remarks (Source)
12.09.06.312	351746 1074952	G. P. Roundy	91	6,673	74	07-25-56	Qal	-	-	Gordon, 1961
12.09.07.3431	351639 1074949	G. P. Roundy	98	6,640	58	11-30-55	Qal	-	-	Gordon, 1961
12.09.08.431	351644 1074829	G. P. Roundy	98	6,770	85	07-25-56	TRc	852	07-25-56	Gordon, 1961
12.09.18.311	351605 1075003	Bluewater B-113	160	6,625	58	04-59	TRc	-	-	Gordon, 1961
12.09.27.4			450			11-09-84				OSE record B-1078
12.09.28.14		Elkins Well	160	6,800	70	05-26-94	Je	750	06-23-09	OSE record B-1272
12.09.28.4		Elkins Ranch	70	6,811	-	10-10-56	TRc	-	-	Coll. By F.A.F. Berry.
12.09.32.322			142		42	02-13-02				OSE record B-1481
12.10.01.222	351815 1075010	G. P. Roundy	192	6,675	46	07-24-56	TRc	27,600	07-24-56	Gordon, 1961
12.01.244	351755 1075011	G. P. Roundy	200	6,675	-	1954	TRc	-	-	Reportedly quite salty.
12.10.05.341	351735 1075506	Duane Berryhill	351	6,705	64	05-18-49	TRc	-	-	Gordon, 1961
12.10.05.341a	351736 1075507	Duane Berryhill	725	6,700	246	01-08-58	Psa	2,820	01-16-59	Gordon, 1961
12.10.07.1433	351704 1075606	Duane Berryhill	250	6,635	177	10-15-55	Psa	2,020	06-27-56	Gordon, 1961

Location ¹	Latitude-Longitude	Number or Name	Total Depth (feet)	Altitude (feet)	Depth to Water (feet)	Date Depth Measured	Principal water-bearing unit(s)	Specific Conductance (umhos at 25° C)	Date SC measured	Remarks (Source)
12.10.12.2213	351721 1075020	G. P. Roundy	81	6,657	68	07-26-56	Qal (?)	-	-	Gordon, 1961
12.10.12.4333	351636 1075037	G. P. Roundy	100	6,625	59 58	11-30-55 07-25-56	Qal	-	-	Gordon, 1961
12.10.14.2123	351630 1075131	G. P. Roundy	-	6,621	50	07-25-56	-	-	-	Water level in nearby abandoned well = 15 feet; Gordon, 1961
12.10.20.333	351452 1075521	Fred Freas	275	6,570	118 124	02-13-57 08-17-57	Psa	-	-	Gordon, 1961
12.10.23.233	351521 1074952	Morris, "Old Jacobs Well"	865	6,529	75 127 148	07-11-46 02-51 08-01-57	Psa	3,040 2,930 2,860	07-12-46 06-25-52 08-10-55	Gordon, 1961
12.10.23.233a	351521 1074952	G. P. Roundy	500	6,594	75	07-11-46	TRc	2,130	07-12-46	Gordon, 1961
12.10.26.23	351429 1075135	Harrison #5	844	6,550	100	03-05-54	Qal, TRc	-	-	Flowed at surface before pumping; Gordon, 1961
12.10.26.322	351421 1075144	Homestake - New Mexico	400	6,573	70	05-26-56	TRc	-	-	Originally 844 feet deep, casing collapsed at 400 feet; Gordon, 1961
12.10.26.3222	351422 1075145	Henderson - Phoenix	870	6,572	122 124	10-13-55 11-14-57	Psa	1,810	10-15-56	Gordon, 1961
12.10.27.222	351447 1075217	Bluewater B-101	160	6,570	50	09-58	Qal	-	-	Gordon, 1961

Location ¹	Latitude-Longitude	Number or Name	Total Depth (feet)	Altitude (feet)	Depth to Water (feet)	Date Depth Measured	Principal water-bearing unit(s)	Specific Conductance (umhos at 25° C)	Date SC measured	Remarks (Source)
12.10.27.244	351425 1075221	Morris and Son	371	6,574	90 89	07-25-56 02-13-57	Qal	2,060	07-25-56	Gordon, 1961
12.10.27.333	351402 1075319	Stanley & Card	551	6,557	87 104	04-18-50 04-12-58	Psa	1,430 1,450 1,440 1,530	10-06-54 07-17-56 05-07-57 04-20-65	Gordon, 1961
12.10.27.4	-	Bluewater B-110	180	6,560	155	12-58	Qal	-	-	Gordon, 1961
12.10.27.4311	351407 1075244	W. A. Murray	584	6,567	112 118	10-15-55 10-02-56	Psa	1,450	07-25-56	Gordon, 1961
12.10.28.44	351401 1075325	Card #1 (ATSF)	398	6,560	81	09-54	Psa	-	-	Gordon, 1961
12.10.29.434	351358 1075439	Stanley & Card	152	6,552	99 65	02-13-57 10-14-44	Qal	765	07-12-46	Pump test 1947.
12.10.29.434a	351358 1075439	Stanley & Card	398	6,554	85 101	02-15-51 02-13-57	Psa	1,480 1,460	06-28-56 05-14-58	Pump test 1948.
12.10.29.434b	351358 1075439	Card #1 (ATSF)	551	6,555	83	02-51	Psa	-	-	Gordon, 1961
12.10.30.1121	351447 1075617	Anaconda	280	6,590	108 143	02-03-47 06-28-56	Psa	779	07-18-56	Gordon, 1961
12.10.30.242	351434 1075526	Jack Freas	160	6,569	88 107	05-10-46 02-11-55	Qal	981 906 885	08-12-53 06-28-56 05-07-57	Gordon, 1961
12.10.30.332	351407 1075615	Hardenburg	230	6,585	106 111	02-04-47 02-10-49	Psa	-	-	Old oil test; cased to 230 feet in 1948.
12.10.30.3333	351359 1075623	E. E. Hardin	175	6,591	-	-	Psa	-	-*	Gordon, 1961

Location ¹	Latitude-Longitude	Number or Name	Total Depth (feet)	Altitude (feet)	Depth to Water (feet)	Date Depth Measured	Principal water-bearing unit(s)	Specific Conductance (umhos at 25° C)	Date SC measured	Remarks (Source)
12.10.30.412	351423 1075546	Fred Freas	225	6,578	90 113	02-26-46 02-13-57	Psa	1,000 1,450	05-10-46 06-05-56	7 additional analyses, SPC varies between 1000-1160 umhos.
12.10.30.421	351419 1075531	M. Harding	245	6,576	88 119	02-26-46 02-13-57	Psa	1,160 1,170 1,160	08-11-53 07-18-56 05-07-57	Gordon, 1961
12.10.31.12	351350 1075603	Bluewater B-99	160	6,580	140	09-58	Psa	-	-	Gordon, 1961
12.10.31.211	351354 1075551	Bar-X Trailer Lodge	175	6,575	122	11-17-77	Psa	-	-	Gordon, 1961
12.10.32.111	351354 1075524	Anaconda Company	253	6,566	82 112	02-26-46 02-13-57	Psa	1,050 1,100 1,040	07-12-46 06-15-55 07-18-56	Pump test 1947 Pump test 1948 Pump test 1952.
12.10.32.211	351354 1075449	Eugene Chapman	135	6,555	75	01-04-47	Qal	-	-	Gordon, 1961
12.10.33.444	351308 1075320	Stanley & Card	195	6,542	-	-	TRc	1,310 1,270	06-28-56 05-07-57	Gordon, 1961
12.10.34.2141	351350 1075241	W. A. Murray	275	6,558	82	-	TRc	3,530 2,090	07-17-56 04-20-65	Gordon, 1961
12.10.34.412	351331 1075234	Bruce Church	978	6,557	99 101	05-54 02-13-57	TRc, Psa	1,900	08-28-56	Gordon, 1961

Well numbering system based on subdivision of public lands (township, range, and section) to the nearest 10-acre tract (USGS and OSE).

Qal = Quaternary Alluvium; TRc = Triassic Chinle sandstone units; Psa = Permian San Andres-Glorieta Aquifer

The water produced from the well complies with New Mexico State drinking water standards for noncommunity, nontransient water systems with the exception of arsenic, which was 0.0115 mg/L and some radioactive components. The water was a calcium-sulfate type, with total dissolved solids of 520 mg/L. The uranium content was 0.0186 mg/L, radon 307 pCi/L, radium (226 + 228) 0.337 pCi/L, gross beta 4.51 pCi/L, and gross alpha 23.2 pCi/L (Shomaker 2009). The NMOSE record for this well indicates that the well is completed in gravelly sandstones between 70 and 155 feet below grade and produces 25 gallons per minute or 36,000 gallons per day. Shomaker (2009b) estimated the specific capacity of the well at 0.49 gallon per minute per foot (gpm/ft) and a transmissivity of 51.5 feet squared per day (ft²/day).

Sandstone Beds of the Chinle Formation: Sandstone beds within the middle and lower portions of the Chinle Formation provide water to wells around the former Homestake Mill site southwest of the project site (Homestake Mining Co. 2010). These beds, if present in the subsurface near the project site, may yield quantities of water to wells, although the yields may be small and not sustainable. The top of the Chinle Formation is projected at a depth of approximately 450 feet below the project site.

Locations of water wells completed in the Chinle Formation in the vicinity of the project site are shown on the geologic map in figure 23. One well located in Section 23 of Township 12 North Range 10 West (Well 12.10.23.233a, figure 23) is apparently completed in a sandstone bed and reportedly had a yield of 300 gallons per minute (table 16). The groundwater in any sandstone beds is expected to be confined by overlying shale units in the vicinity of the project site. Flows would be artesian; for example, Well 12.10.23.233a was completed to a depth of 500 feet and the water level in this well was reported to be 75 feet below grade in 1946 (Stone et al. 1983; table 16).

Several wells in the vicinity of the project site are completed in the upper portion of the Chinle Formation; locations of these wells are shown on the geologic and well location map in figure 23. Depths of these wells range from 91 feet to 200 feet; water levels range from 46 feet to 85 feet below grade (Stone et al., 1983, table 16). No yields for these wells were reported by Stone et al. (1983). The quality of water from upper Chinle wells in the area is variable, with estimated total dissolved solids (TDS) ranging from approximately 16,000 mg/l to 550 mg/l, based upon electrical conductance reported by Stone et al. (1983). Uranium concentrations in wells representing ambient conditions in the former Homestake Mill site area vary spatially and have ranged from <0.0003 to 0.106 mg/L. Radium concentrations have ranged from <1.0 to 7.6 pCi/L (Homestake Mining Co. 2010).

San Andres-Glorieta Aquifer: The principal source of reliable potable groundwater in this region is the San Andres-Glorieta aquifer system (White and Kelly 1989). This unit generally provides adequate water for domestic and stock wells and is locally a prolific producer where karst or structural shearing conditions are present. The San Andres Limestone and underlying Glorieta Sandstone are generally hydraulically connected and behave as a single hydrologic unit. The San Andres-Glorieta Aquifer is present at a depth of about 1,800 feet and has an estimated thickness of approximately 75 feet at the project site. White and Kelly (1989) estimated the thickness of the San Andres Limestone and Glorieta Sandstone at 25 feet and 50 feet, respectively, in the area.

The San Andres-Glorieta Aquifer receives recharge along the northern flank of the Zuni Mountains, where the Zuni uplift has exposed the system in outcrop over a relatively wide area

approximately 10 miles southwest of the project site. Recharge to the system moves down-dip within the aquifer, generally from south to north. The overlying Chinle shales act as confining beds to water within the aquifer system, and an artesian pressure is developed. The water level in wells completed in this unit rise above the top of the system, sometimes reaching the surface and creating a flowing well. The geometry of the San Andres-Glorieta Aquifer and potentiometric surface in the vicinity of the project site are depicted on the hydrogeologic cross section in figure 24.

Prolific production has been noted in the San Andres-Glorieta Aquifer in the vicinity of the project site. Production exceeding 1,500 gallons per minute was obtained from two wells completed in the San Andres-Glorieta Aquifer located approximately 5 miles west of the project site in Sections 23 (figures 23 and 24; table 16) and 26 of Township 12 North Range 10 West (Well 12.10.23.233 and 12.10.26.242). Quality of water from these wells is somewhat mineralized, having TDS in the range of 1,800 milligrams per liter (mg/l, estimated from electrical conductance, table 17) or 1.8 parts per thousand dissolved solids.

This water is very hard, from a potable water standpoint, and would need some form of treatment if used as drinking water, although it is suitable for many other uses. For reference, water is considered hard if TDS exceeds approximately 500 mg/l. Uranium concentrations in wells in the vicinity of the former Homestake Mill site, which represent ambient conditions, have ranged from <0.01 to 0.025 mg/L. Radium concentrations in these same wells have ranged from <1.0 to 3.05 pCi/L (Homestake Mining Co. 2010).

Environmental Consequences

No Action Alternative

If the No Action alternative is selected, groundwater and surface water flow rates would remain unchanged from existing conditions. Sediment transport and surface water quality would remain unchanged relative to existing conditions. No new wells would be installed and erosion control measures would not be required.

Proposed Action

Construction

Surface Water

Construction of the proposed project during both phases could indirectly affect ephemeral surface water resources by increasing stormwater runoff and sediment loads from the site, although they would not reach other surface water because runoff does not appear to flow as far as San Mateo Creek. Impacts to surface water would be primarily on and near the site and associated with construction activities such as soil salvage operations, road construction, and facilities construction. All of these activities have the potential to impact the quantity and quality of surface water runoff. Site preparation and grading activities will remove vegetation and expose and compact soils, thereby increasing stormwater yield, erosion rates, and sediment loading to the ephemeral drainages.

92 Table 17. Summary of water quality data from wells in the vicinity of the La Jara Mesa Project

Location ¹	Date ²	Geologic Unit	Specific Conductance	pH	Hardness as CaCO ₃		Dissolved												
					CaC ₃	Non-CaC ₃	Ca	Mg	Na	Na + K	K	HC ₃	CO ₃	SO ₄	Cl	F	SiO ₂	TDS	NO ₃
			µmhos		mg/L		mg/L												
12N.09W.08.431	56-07-25	Trc	852	8.9	12	0	-	-	-	163	-	246	18	57	53	-	-	-	-
12N.09W.28.14	09-05-21	Trc	750	7.72	180		63	8.4	98		1.0		216	190	32			588.8	5.5
12N.10W.01.222	56-07-24	Trc	27,600	6.8	2,470	2,440	-	-	-	5,740	-	34	0	1,350	9,590	-	-	-	-
12N.10W.05.341A	59-01-16	Trc	2,820	6.9	864	292	-	-	-	-	-	698	0	780	144	-	-	-	-
12N.10W.07.1433	56-06-27	Psa	2,020	7.1	735	324	-	-	-	198	-	502	0	553	126	-	-	-	0.3
12N.10W.23.233	46-07-12	Psa	3,040	-	996	420	254 -	88	-	379	-	702	0	829	270	0.4	-	2,170	0.6
	47-06-04		2,880	-	-	-		-	-	-	-	669	0	794	238	-	-	-	-
	48-04-08		2,960	-	-	-		-	-	-	-	688	0	-	250	-	-	-	-
	49-08-18		2,960	-	-	-		-	-	-	-	686	0	-	254	-	-	-	-
	50-10-16		2,900	-	-	-		-	-	-	-	668	0	-	239	-	-	-	-
	52-06-25		2,930	-	-	-		-	-	-	-	682	0	-	245	-	-	-	-
12N.10W.23.233	52-08-25	Psa	2,910	-	-	-	-	-	-	-	-	675	0	-	250	-	-	-	-
	55-08-10		2,860	6.8	930	392	-	-	-	346	-	656	0	772	242	-	-	-	-
12N.10W.23.233A	46-07-12	Trc	2,130	-	140	0	40	11	-	450	-	390	0	730	37	0.4	-	1,480	4.4
12N.10W.26.242	58-05-22	Psa	2,500	7.1	838	333	214	74	-	302	-	617	0	671	205	0.5	16	1,790	1.2
12N.10W.26.3222	56-10-15	Psa	1,810	7.0	688	306	65	128	-	153	-	466	0	467	106	0.7	15	1,170	3.2
12N.10W.27.244	56-07-25	Qal	2,060	7.7	660	428	-	-	-	250	-	284	0	808	86	-	-	-	10
12N.10W.27.333	54-10-06	Psa	1,430	-	590	281	-	-	-	106	-	377	0	394	65	-	-	-	11
	56-07-17		1,450	7.3	610	301	-	-	-	102	-	377	0	407	65	-	-	-	9.5
	57-05-07		1,440	7.3	598	289	-	-	-	107	-	377	0	407	65	-	-	-	9.1
	65-04-20		1,530	7.4	628	341	170	50	-	107	-	350	0	451	66	0.5	16	1,050	13
12N.10W.27.4311	56-07-25	Psa	1,450	7.3	580	260	-	-	-	120	-	390	0	390	72	-	-	-	6.9
12N.10W.29.434	46-07-12	Qal	765	-	342	152	94	26	-	40	-	232	0	194	16	0.5	-	499	14
12N.10W.29.434A	56-06-28	Psa	1,480	7.4	640	430	-	-	-	97	-	260	0	520	58	-	-	-	31
	58-05-14		1,460	7.6	620	400	-	-	-	93	-	260	0	500	58	-	-	-	-

Location ¹	Date ²	Geologic Unit	Specific Conduc- tance	pH	Hardness as CaCO ₃		Dissolved												
					CaC ₃	Non- CaC ₃	Ca	Mg	Na	Na + K	K	HC ₃	CO ₃	SO ₄	Cl	F	SiO ₂	TDS	NO ₃
			µmhos		mg/L		mg/L												
12N.10W.30.1121	56-07-18	Psa	779	7.7	356	118	-	-	-	32	-	291	0	134	16	-	-	-	32
	57-05-08		835	7.4	388	154	-	-	-	31	-	286	0	135	24	-	-	-	58
12N.10W.30.242	53-08-12	Qal	981	-	-	-	-	-	-	-	-	366	0	-	22	-	-	-	-
	56-06-28		906	7.5	468	202	-	-	-	18	-	325	0	178	24	-	-	-	26
	57-05-07		885	7.7	454	186	-	-	-	20	-	327	0	172	24	-	-	-	20
12N.10W.30.412	46-05-10	Psa	1,000	-	493	288	130	41	-	29	-	251	0	259	38	0.3	-	653	32
	48-08-05		1,100	-	-	-	-	-	-	-	346	0	-	38	-	-	-	-	
	49-08-18		1,130	-	-	-	-	-	-	-	349	-	-	37	-	-	-	-	
	51-09-00		1,160	-	-	-	-	-	-	-	344	0	-	36	-	-	-	-	
	52-06-25		1,140	-	-	-	-	-	-	-	350	0	-	38	-	-	-	-	
12N.10W.30.421	55-08-10	Psa	1,150	7.3	536	256	-	-	-	36	-	342	0	270	38	-	-	-	-
	56-06-05		1,450	7.6	605	315	-	-	-	86	-	354	0	394	65	-	-	-	-
	53-18-11		1,160	-	-	-	-	-	-	-	352	0	-	37	-	-	-	-	
	56-07-18		1,170	7.5	570	306	-	-	-	40	-	323	0	317	38	-	-	-	27
12N.10W.30.421	57-05-07	Psa	1,160	7.4	524	266	-	-	-	46	-	315	0	282	36	-	-	-	26
12N.10W.30.433	44-10-21	Psa	919	-	405	160	98	39	-	51	-	299	0	190	33	-	-	590	32
12N.10W.32.111	46-07-12	Psa	1,050	-	487	234	125	42	-	50	-	308	0	268	32	0.5	-	691	21
	55-06-15		1,100	7.3	520	278	-	-	-	-	-	295	0	-	30	-	-	-	22
	56-07-18		1,040	7.5	492	262	-	-	-	41	-	281	0	295	23	-	-	-	14
12N.10W.33.444	56-06-28	Trc	1,310	8.2	115	0	-	-	-	265	-	404	0	327	12	-	-	-	2.4
12N.10W.34.2141	57-05-07	Trc	1,270	7.8	130	0	-	-	-	254	-	420	0	307	13	-	-	-	0.2
	56-07-17		3,530	7.9	364	209	-	-	-	719	-	189	0	1,590	74	-	-	-	14
	65-04-20		2,090	8.5	86	0	-	-	-	-	-	295	10	-	27	-	-	-	2
12N.10W.34.412	56-08-28	Trc	1,900	7.8	138	0	-	-	-	378	-	305	0	563	88	-	-	-	0.6

1. Well numbering system based on subdivision of public lands (township, range, and section) to the nearest 10-acre tract (USGS and OSE)
2. Date format: year-month-day
3. µmhos = micromhos; mg/L = milligrams per liter
4. Qal = Quaternary Alluvium; TRc = Triassic Chinle sandstone units; Psa = Permian San Andres-Glorieta Aquifer

Source: Elkins Well 12.9.28.14, Shomaker 2009a

In general, impacts to surface water resources during construction would be minor to moderate for the watershed immediately below the project site. Although increased erosion is expected, no existing surface waters (San Mateo Creek) will be affected. Impacts would be reduced to minor by successfully implementing onsite stormwater controls. All construction activities would be permitted under the NPDES Stormwater SWPPP under a Multi-Sector General Permit. The SWPPP would be developed in consultation with New Mexico MMD and potentially EPA Region 5 representatives to identify design parameters and appropriate best BMPs for stormwater management at the proposed site. The SWPPP would be certified by a New Mexico licensed professional engineer. The basic design storm event frequency parameters for the various facilities of the projects stormwater plan included in the plan of operations are summarized in table 18.

Table 18. Summary of design storm event frequency for proposed project stormwater facilities

Facility	Design Storm Event	
	Frequency	Precipitation (inches) ¹
Stormwater Pond Volume	100-year/24-hour	2.72
Ore Stockpile Stormwater Pond Volume	100-year/24-hour	2.72
Emergency Spillway Peak Flow	100-year/24-hour	2.72
Internal Ditches Peak Flow	25-year/6-hour	1.86
Diversion Ditches Peak Flow	100-year/6-hour	2.38
Culvert Peak Flow	100-year/24-hour or 25-year/6-hour	2.73 or 2.38

Grants Airport Precipitation Frequency Estimates from NOAA, 2006. Precipitation-Frequency Atlas of the United States. NOAA Atlas 14, Volume 1, Version 4 National Weather Service, Silver Spring, Maryland.

Impacts to surface water runoff would also be reduced during the construction phase by employing BMPs identified in the erosion and sediment control plan including: limiting vegetation removal only to areas directly affected by project mine facilities; scheduling growth medium removal activities for dry periods; revegetating disturbed areas and stabilizing with mulch, avoiding off-road vehicle travel; and installing other protective BMPs including sediment traps, dugout ponds, berms, dispersion ditches, and sediment filter fabric based on local hydrologic conditions. Stormwater flowing down the slopes above the proposed site would be diverted away from the active project area and channeled into existing channels south of the site. Access road improvements during the construction phase include widening to 14 feet, with pullouts for passing and installation of appropriately sized culverts. The access road is also sited to minimize the number of drainage crossings to reduce surface water impacts. None of the surface water leaving the project site is expected to reach a permanent or intermittent surface water body because it either percolates quickly into the ground or evaporates before reaching San Mateo Creek.

Groundwater

The advancement of the portals, incline, and underground mining beneath La Jara Mesa would extend from the base of the mesa northeastward along an incline from the portal, and would

extend to greater depths beneath the land surface of the mesa above, even with the upward incline to the targeted ore body. No perched water zones have been encountered during earlier exploration activities. Hundreds of exploratory wells were drilled to a depth below the proposed elevation of the bottom of the mine shaft. Therefore, the mine workings in the ore zones would be completed in unsaturated rocks and these workings would, therefore, not expect to encounter saturated rocks. Some water would be introduced during construction and drilling activities, but much of this water is expected to be removed with the broken rock that would be placed in the waste rock facilities where the water would evaporate.

The anticipated potable and nonpotable uses of groundwater in the surface buildings (sinks, showers, and lavatory facilities) are expected to be about 2,500-10,000 gallons per day (based on an assumed use of 50-100 gallons per person per day and 25-100 employees at the project during phases 1 and 2). If this volume is discharged to a septic tank and leach field system, it would be permitted with the New Mexico Environment Department in accordance with the New Mexico Water Quality Control Commission (WQCC) regulations and rules. The septic system and leachfield would be located near the project area buildings. The segregation or recycling and beneficial use of the gray water fraction from potable use at this site was not practical given the relatively small volume available and uncertainties with respect to State permitting and building code requirements.

The mining operation will also be subject to a discharge permit application and regulatory consideration with respect to the water quality control regulations and rules. If a permit is required, then monitoring of groundwater and/or surface water would be developed as an element of compliance and the site. Any contamination would be subject to mitigation under these regulations if there were a release from the site.

Groundwater Withdrawal

During development and mining, groundwater for the project is anticipated to be pumped from the Entrada Sandstone aquifer and supplemented by pumping from deeper Chinle Sandstone aquifer or by pumping the entire amount from the deeper San Andres-Glorieta aquifer. During the development phase, the pumping rate would be 34,500 gpd. During the mining phase, it would be 50,000 gpd. If this supply is pumped from the shallower Entrada/Chinle for the anticipated 20 years of mine life, the additional drawdown in the nearest pumping well, which is at a radial distance of 4,700 feet, is estimated to be about 2 feet. If the supply is pumped from the deeper confined San Andres-Glorieta aquifer, the additional drawdown at this same radial distance at the nearest well is less, estimated to be on the order of 0.15 foot (2 inches). There are no surface water bodies in hydraulic connection with these aquifers within 3 miles of the site, therefore, the pumping of groundwater for water supply would not have any measurable effect on surface waters during the life of the mine, including any effect on San Mateo Creek.

Environmental Geochemistry

During the development and mining of the proposed project, underground development waste rock would be transported to the surface for use in the construction of the portal facility pad area. The estimated waste rock facility should contain about 270,000 cubic yards of material. The estimated percentages and volumes of waste rock material by major geologic unit that would be placed in the surface waste rock facility are included in table 19.

Table 19. Projected volumes and relative percentages of underground development waste rock to be placed in the waste rock facility

Geologic Unit	Volume (cubic yards)	Volume (Percent)
Basalt	140	<1
Ash Deposit	660	<1
<i>Mancos Group</i>	510	<1
<i>Dakota Sandstone</i>	200	<1
<i>Morrison Formation</i>		
Upper bed of Brushy Basin Member	170	<1
Poison Canyon bed of Brushy Basin Member	140	<1
Lower bed of Brushy Basin Member	12,300	5
Salt Wash (a.k.a Westwater Canyon) Member	151,900	56
<i>Bluff Sandstone</i>		
Recapture Shale Member	17,380	6
Bluff Sandstone main body	86,600	32
Total	270,000	100

Source: Laramide Resources (USA) Ltd. unpublished estimates

Ore Geochemistry

The typical primary ore of the Grants mineral belt consists of uranium-enriched humic material that coats sand grains and impregnates the Poison Canyon Sandstone, imparting a dark color to the rock (Fitch 1980). A direct correlation generally exists between uranium content and organic carbon content by weight percent in the ores. Although coffinite and uraninite are typically identified in the black ores, there are other uranium-bearing phases, expected to be oxides. Other elements that are typically enriched in these ores include manganese, iron, molybdenum, selenium, copper, silver, nickel, cobalt, chromium, arsenic, and lead (Plumlee et al., 1999). Fitch (1980) notes these deposits might be more accurately characterized as humate deposits that contain enriched amounts of these metals; however, other than uranium, these metals are not present in sufficient quantity to be recovered economically.

Uranium mineralization occurs in the project area primarily as coffinite ($U(SiO_4)_{1-x}(OH)_x$) in tabular deposits in the Poison Canyon bed of the Brushy Basin Member of the Morrison Formation (Adamson and Betts 1983; Smith and Petersen 1980; Petersen 1980). The mineralized material is strongly humate stained, which is both present in interstitial aggregates and as rims on clasts, which imparts a very strong black color to the rocks. The stratigraphic position and location of economic mineralization at the project site are schematically shown on the hydrogeologic cross section in figure 24. This mineralization formed in Poison Canyon member strata, typically in the depositional environments characterized by stream channel bottom sediments and near the margins in straight channels and feeder channels, meanders into overflow (swamp) areas. Generally, the mineralization is associated with carbon and indistinct organic matter, characterized as humates. These humates are presumed to have formed from the

breakdown and dissolving of vegetal matter and redeposited in mineralized zones. Pyrite and jordisite (a soft, black molybdenum mineral (MoS_2)) are frequently found as associated minerals in the arkosic sandstone host rock. The mineralization is found as coatings on sand grains and fillings in the interstices between grades. The interstices are also filled with very fine kaolin. The humates and jordisite, when present, give the mineralized rock a dark to black color.

Exploration data for the site has been reviewed by Environmental Restoration Group (2010). Table 20 includes the following summary of the radiological data from one of the representative exploration boreholes.

Table 20. Radiological summary of exploration borehole data

Formation	Uranium (pCi/g)	Uranium (mg/kg)	Gross Alpha (pCi/g)	Gross Alpha Precision	Radium- 226 (pCi/g)	Thorium- 230 (pCi/g)
Morrison (Recapture Member)	4.3	6.5	740	39.8	1.9	0.6
Morrison (Westwater Member)	2.1	3.2	528	34	0.5	0.6
Morrison (Brushy Basin Member)	1.8	2.7	570	36.6	1.1	0.5
Morrison (Poison Canyon Sandstone)	614	920	55,800	313	168	242
Bluff Sandstone	0.3	0.5	223	32.8	Not Detected	Not Detected

Source: Environmental Restoration Group 2010

For comparison, they indicated in their analysis that the normal total uranium background concentrations in the alluvial soils in the area would be expected to be 2 to 6 pCi/g. They also indicated that soils in other parts of the area are at or below about 4 pCi/g total uranium. The conversion from pCi/g to mg/kg of total uranium is 1.5, and all but the ore zone (Poison Canyon Member) value is within or below the alluvial uranium background range.

Environmental Restoration Group (2010) also indicated the radium-226 and thorium-230 isotope concentrations in the ore zone sample are at or below the expected concentrations for secular equilibrium. This is desirable, as radium-226 is a principal source of gamma rays and radon production. According to Environmental Restoration Group (2010), the analysis indicated that by minimizing the ore content (Poison Canyon) material in the waste rock, the radionuclide content of the waste rock would be comparable to background levels.

The uranium and associated mineralization associated with subore grade material, largely the Bluff Sandstone waste rock, that is not hauled away from the project area has some potential to be mobilized into the weathering environment. The carbonate content of the rocks and its ability to neutralize any acid formed is expected to limit the mobility of uranium and other metals from the waste rock. In alkaline solutions, similar to what is expected in the project area, uranyl carbonate aqueous complexes may form and would facilitate the solubility of uranium to some degree, although at much lower concentrations than under acidic conditions (Langmuir 1997; Wanty et al.

1999). Even if mobilized, uranium and other metal concentrations would be decreased and attenuated with migration through the rock and soils in and below the piles due to adsorption reactions to mineral surfaces and through co-precipitation and dilution processes. Uranium adsorption is strongest at near neutral pH values, particularly in the absence of complexing agents (Wanty et al. 1999).

The daughter production formed by the radioactive decay of uranium may also be present in these same waste rocks. Of these, radium is probably the element most likely to be soluble and migrate any distance from a source. The solubility of radium, like uranium, would be greater under acidic conditions, which are unlikely at the site. Soluble radium is also subject to similar attenuation mechanisms discussed for uranium.

In general, uranium, radium, and other metals released during the weathering of waste rock and in the absence of acidic conditions would be attenuated to background levels by natural processes (Wanty et al. 1999). This includes physical adsorption to clay and ferrihydroxide minerals in the rocks and precipitation of mineral salts on the surfaces of the soil solids. The mobilization in the dissolved phase as a solute would also be largely limited by the unsaturated conditions by high evaporation rates and low permeability of the shale component of underlying rocks and in the waste rock and by the clayey soils in the area.

Seepage

Most of the waste rock associated with the construction of the portals and the raise does not contain significant uranium mineralization or sulfide mineralization (Environmental Restoration Group 2010; Adamson and Betts 1983). Therefore, the weathering of these waste rocks is not expected to adversely affect seepage water quality relative to the natural weathering processes affecting outcrop exposures of these same rocks. The only mineralized rocks expected to have the potential to impair water quality are those waste rocks mined near the ore horizons in the Poison Canyon member of the Morrison Formation, which represent less than 1 percent of the development waste rock to be placed in the pile below the mine portals. Ore grade material would be removed from the site as part of operations, so their exposure to weathering and potential to generate leachate would be limited.

Seepage and runoff from these facilities would be controlled onsite and the water used as part of operations. Water use in the underground working area would range from 5 to 10 gallons per minute during development activities. Water used for drilling in the underground operations area is expected to largely be incorporated with the broken waste rock and ore that is removed from the mine and placed in piles. It is expected that the majority of this moisture would be evaporated when the development rock is brought to the surface and any seepage would be controlled. Seepage and impaired water quality from the waste rock pile that results from incident precipitation on the pile surface would be controlled by collection at the toe of the waste rock pile in a sump constructed in the underlying low permeability liner. This collected water would be evaporated or reused at the project site. If necessary to maintain adequate storage volume, evaporite minerals and sludges from the sump would be removed and placed back on the waste rock pile. The water supply to the project is expected to be potable and, therefore, the uranium and radium concentrations of this water are expected to be below applicable standards. The evapoconcentration of these waters with the waste rock would not appreciably increase the concentrations of radionuclides in the subsequent leachate.

Seepage from the stormwater catchments below the waste rock facility are expected to be limited by the low hydraulic conductivity of the materials used to construct the catchments and the low permeability of the rocks that underlie the catchments. This water would be evaporated or reused at the project site. Sediment and sludges in these catchments would be removed periodically to preserve adequate storage volume and would be placed on the waste rock facility.

The discharge of septic effluent from the site would be permitted with the State of New Mexico and in compliance with the water quality control regulations. The wastewater from onsite sewage facilities would be treated through the use of a septic tank with an adsorption system consisting of a leach field. The treatment process involves a separation of solids, which remain in the tank, from the liquid wastewater, which is introduced to the soil in the leach field. The dispersal of the effluent into soils in the leach field leads to treatment of nitrogen and other constituents of concern largely by soil adsorption. Although some seepage may occur below the treatment zone, there is little potential for this effluent to impact the quality of the shallowest aquifer beneath the site. The thick sequence of low permeability sedimentary rocks that underlie the site would prevent recharge from reaching the shallowest aquifer.

Operation

Surface Water

Changes to surface water resource flow and quality during the operational phase of the proposed project are possible due to increases in stormwater runoff and sediment loads from the developed site. Runoff from disturbed areas, access roads, and stockpile facilities will increase the volume of water entering the ephemeral drainages. Additionally, surface water quality can be impacted by increased erosion and sediment delivery as well as potential contamination from chemicals, fuels, and mineralized ore materials.

Impacts to surface water resources during operations would be minor after implementing the stormwater plan provided in the plan of operations. Stormwater and sediment controls (i.e., diversion ditches, sediment traps/detention basins) would be constructed to minimize potential erosion and sediment loading during mining operations. The plan of operations calls for both the diversion of run-on from above the site and capturing stormwater generated within the disturbed areas. Stormwater run-on that would normally run onto the project operational area from upgradient areas will be rerouted into engineered conveyances that would direct stormwater around the project area and back into the natural drainages downgradient of the project site.

Stormwater that originates within the operational footprint of the project site would be captured and conveyed through engineered perimeter ditches into a 100-year/24-hour stormwater catchment on the southern edge of the site. The stormwater catchment will be underlain by compacted clay and water would be allowed to evaporate or be reused in mine operations for underground dust control. Discharges from the catchment that may occur would be from an agency approved stormwater outfall. Stormwater generated from the ore stockpile will be handled separately from the stormwater generated by other site facilities. The ore stockpile will be located in a depression graded into the waste rock dump and underlain by compacted clay. This arrangement would contain stormwater from the ore stockpile to drain into itself. Overflows from this ore stockpile area would be contained in a separate pond on top of the waste rock dump per the design criteria included in the mine plan. Implementation of stormwater controls at the project site would reduce stormwater flow by the amount that is captured on the project site and lost to

evaporation. Water that would be released from capture systems at the project would have lower sediment load than natural stormwater.

To reduce the potential of water resource contamination from fuel and chemical products required for the operation, the plan of operations provides details regarding the transport, handling, and storage of these materials. Specifically, fuels will be stored in aboveground tanks placed on a synthetic liner and within secondary containment berms designed to contain the full volume of the tanks with a 6-inch freeboard. Oils, lubricants, solvents, and antifreeze will be stored in approved containers or cabinets and waste products will be transported offsite by a qualified contractor to an approved disposal facility. The SWPPP that will be developed for the proposed operation will also require SPCC protocols including cleanup procedures as well as spill kits, sorbent pads, and granular absorbents.

Several unimproved dirt roads or trails are present upgradient of the proposed project area. The mine plan calls for modifying current runoff patterns associated with the existing roads to minimize headcutting and loss of sediment into the operational footprint area. Access roads into and within the operational footprint of the project would be improved with gravel bedding, ditches, sediment traps, filter fabric, and berms installed based on local hydrologic conditions to minimize stormwater runoff and sediment transport.

Reclamation of the site would be implemented upon mine closure and entails regrading slopes to a 3:1 gradient or less, placement of growth media and revegetation. The final reclamation and closure plan including surface water controls and monitoring will be approved by the State as part of the mine permitting requirements.

Groundwater Quality

The mining operations would not have an impact on regional groundwater quality. The mine development and workings would all be in unsaturated rocks well above the regional aquifer. The estimated separation between the workings and the first potential aquifer, which may be thin sandstone beds in the Chinle Formation, is about 1,700 feet. The first known aquifer, the San Andres-Glorieta Aquifer, is more than 1,800 feet. Additionally, these intervening units consist of Jurassic and Triassic strata and much of the thickness includes the Chinle Formation, a shale-dominated sequence that confines both any intraformation sandstone beds as well as the underlying San Andres-Glorieta Aquifer.

Groundwater Supply

Because the existing Elkins well would not provide sufficient supplies for anticipated demands during mining operations (phase 2), alternate sources of water are planned. This is likely to be a combination of trucked water for potable water use and/or groundwater from a deeper well drilled at the Elkins property site. The existing Elkins well has been pump tested to deliver 25 gpm or up to 36,000 gpd. This requires approximately 14,000 additional gpd for the project. This could come from a combination of 2 to 3 water trucks per day during peak summer use, providing 6,000 to 9,000 additional gallons per day, and or a second well at the Elkins property location drilled into deeper aquifers.

For example, a well drilled into the sandstones in the Chinle Formation could provide additional water for the project. A well drilled to the much deeper San Andreas-Glorietta aquifer beneath the Chinle Formation would generate more than enough water for all uses. Any additional water

would be treated at the site to a level suitable for potable uses (showers, sinks, etc.) or used as-is for mining and dust control purposes. Drinking water may still be delivered onsite for drinking use only. Water hauled to the site would be along existing rights-of-way.

Cumulative Effects

The cumulative effect on surface and groundwater resources considers the potential adverse impacts of the proposed project when added to impacts from past, present, and foreseeable future activities at the mine site, at Mt. Taylor, and downstream to the nearest surface water. Cumulative groundwater effects were evaluated as far as 3 miles away to focus on the area of potential effect, the nearest residence, and nearest surface water.

Past and present (ongoing) impacts to surface quantity and quality are primarily associated with road development and surface disturbances resulting from previous mineral exploration, starting in the 1950s, both on and in the vicinity of the proposed site. These mining related disturbances are also present in numerous locations throughout the Mt. Taylor Ranger District. Impacts associated with present and foreseeable future land management activities include livestock grazing, gravel mining, and timber management. These activities will continue to affect surface water resources in the Mt. Taylor Ranger District and the two-county region.

Past impacts to groundwater include past mining practices or milling practices that have contaminated groundwater and that are currently in remediation. Other proposed mine exploration and development projects in the vicinity of the proposed action include a proposed underground uranium mine located 8 miles north of the site (Roca Honda). Final approvals for water disposal have not been determined but would contribute to any other ongoing or foreseeable water resource impacts on Mt. Taylor. A separate EIS is being prepared for that mine project and a final EIS and record of decision has not been issued.

Groundwater resources that are proposed for use on the project site would be obtained from redeployment of existing groundwater rights to the new use, resulting in no net gain or loss of water in the area. It is anticipated that only the consumptive use portion of the water rights proposed for the project can be transferred; therefore, any return flow credits that may have been approved for these water rights would not be transferred to the new beneficial use.

There will be no significant water quality impacts from project activities to the groundwater aquifers beneath the site, largely due to their depth beneath the project. There will be minor impacts to groundwater levels during operation due to groundwater withdrawals for water supply. Ephemeral groundwater in the shallow drainages may be affected in the vicinity of the project by seepage from the septic system and leach field during the operational period. The system will meet State and county standards, thus the impact of the septic discharge on the water quality would be minor. Therefore, there are no significant cumulative groundwater impacts anticipated from this project.

Because no operational surface water will leave the site, and stormwater from the site appears to stop at a dunes area and infiltrate into the ground approximately 2 miles from San Mateo Creek, no cumulative surface water impacts are expected to San Mateo Creek or other surface water.

Because the few ranch wells in the area are utilized largely for stock tanks and some domestic use, the cumulative impact on the aquifer(s) from pumping for the project will be small: about 2 feet of drawdown is estimated from the shallower aquifer and approximately 0.15 foot (2 inches)

from the San Andres-Glorieta Aquifer, at a radial distance of about 4,700 feet (the distance to the nearest ranch well from the proposed pumping well) over the life of the project.

Vegetation

Affected Environment

The project area falls within the Great Basin conifer woodland plant community as defined by Dick-Peddie (1993). The ecoregion for the project area is the White Mountains-San Francisco Peaks-Mogollon Rim (McNab and Avers 1994). The typical vegetation for this ecosystem is predominantly ponderosa pine (*Pinus ponderosa*) and gambel oak (*Quercus gambellii*).

Terrestrial

The dominant plant community is pinyon-juniper woodland. The dominant overstory consists of pinyon pine (*Pinus edulis*) with scattered one-seed juniper (*Juniperus monosperma*). The dominant mid-story plants are threadleaf sagebrush (*Artemisia filifolia*), long flower rabbitbrush (*Chrysothamnus depressus*), scattered four-wing saltbush (*Atriplex canescens*), fringed sagebrush (*Artemisia frigida*), big mountain sagebrush (*A. tridentata*), and cholla (*Cylindropuntia* spp.). The herbaceous layer includes hairy golden aster (*Chrysopsis villosa*), common sagewort (*A. campestris*), paper daisy (*Psilostrophe tagetina*), sandhill muhly (*Muhlenbergia pungens*), scattered broom snakeweed (*Gutierrezia* spp.), Indian ricegrass (*Achnatherum hymenoides*), blue grama (*Bouteloua gracilis*), hairy grama (*Bouteloua hirsuta*), buckwheat (*Eriogonum* spp.), penstemon (*Penstemon* spp.), prickly pear (*Opuntia* spp.), and banana yucca (*Yucca baccata*). Scattered ponderosa pines are situated along the rim above the proposed surface portal facilities. No noxious weeds were identified in the project area during the August 2009 field surveys (Ecosystem Management, Inc. 2009).

Riparian/Aquatic

There are no perennial streams or aquatic habitat located within the proposed project area so there is no occurrence of riparian or aquatic vegetation. The nearest perennial stream is located a few miles east of the project and across Highway 605.

Federally Listed Threatened and Endangered Plant Species

There are two United States Fish and Wildlife Service (USFWS) threatened plant species known to occur, or that might potentially occur, in Cibola County. There are no listed endangered species. Based on the vegetative, geographical, and topographical characteristics of the project area, and the life requisites of the Federal threatened species, no federally listed species have the potential to occur within the project area (table 21).

USFS Sensitive Species

A list of protected plant species with potential to occur within the project area was obtained on July 31, 2009, from the Forest Service. The Forest Service listed five special status plant species that occur or may occur in the Mt. Taylor Ranger District. Based on the vegetative, geographical, and topographical characteristics of the project area and the life requisites of the Forest Service Mt. Taylor Ranger District listed species (table 22), no Forest Service listed sensitive plant species have the potential to occur within the project area.

Table 21. USFWS protected plant species with potential to occur in Cibola County, NM

Common Name	Status*	Typical Habitat Description	Reason(s) for Elimination
Plants			
<i>Erigeron rhizomatus</i> Zuni fleabane	T	Nearly barren detrital clay hillsides with soils derived from shales of the Chinle or Baca formations	No suitable habitat within or near project area
<i>Helianthus paradoxus</i> Pecos sunflower	T	Desert wetlands or cienegas (springs) with saline soils	No suitable habitat within or near project area

*T = Threatened

Source: USDI FWS 2010.

Table 22. Region 3 Forest Service sensitive plant species with potential to occur in Mt. Taylor Ranger District

Scientific Name	Status	Typical Habitat Description	Reason(s) for Elimination
Plants			
<i>Astragalus accumbens</i> Zuni milkvetch	Sensitive	Gravelly clay banks and knolls in alkaline soils derived from sandstone in pinyon-juniper woodlands.	No suitable habitat; no gravelly clay banks or knolls and no saline soils in the project area.
<i>Astragalus humistratus</i> var. <i>crispulus</i> Villous groundcover milkvetch	Sensitive	Slopes, benches, and ledges on sandy soils from volcanic origins in xeric pine forests; known only in Catron County.	No suitable habitat; no xeric pine forests in the project area.
<i>Astragalus micromerius</i> Chaco milkvetch	Sensitive	Gypseous or limy sandstones in pinyon-juniper woodland or Great Basin desert scrub.	No suitable habitat; no gypseous or limy sandstone observed in the project area.
<i>Clematis hirsutissima</i> var. <i>hirsutissima</i> Arizona leatherflower	Sensitive	Moist mountain meadows, prairies, and open woods and thickets on limestone soils in mixed conifer and ponderosa pine woodlands.	No suitable habitat; no limestone soils in the project area.
<i>Erigeron sivinskii</i> Sivinski's fleabane	Sensitive	Chinle shale in pinyon-juniper woodland and Great Basin desert scrub; known to occur in McKinley County.	No suitable habitat; no Chinle Formation cropping in the project area.

Source: NMRPTC 1999, updated July 22, 2010.

Noxious Weeds

As defined by the New Mexico Department of Agriculture, noxious weeds are plants that are not native to a particular ecosystem and can spread rapidly if left unmanaged. The Mt. Taylor Ranger District lists five species as noxious weeds (table 23). No noxious weeds were observed in the project area during the August 2009 field surveys (Ecosystem Management, Inc. 2009).

Table 23. Noxious weeds with potential to occur in Mt. Taylor Ranger District

Scientific Name	Common Name
<i>Acroptilon repens</i>	Russian knapweed
<i>Carduus nutans</i>	Musk thistle
<i>Cirsium vulgare</i>	Bull thistle
<i>Onopordum acanthium</i>	Scotch thistle
<i>Tamarisk</i> spp.	Salt cedar

Source: Zamora, February 4, 2010.

Environmental Consequences

No Action Alternative

Under the no action alternative, the project would not be constructed and there would be no impacts to vegetation from the project. The current management practices administered by the Forest Service on National Forest System lands and those of private landowners on private land would continue within the project area. These include cattle grazing during the summer for up to 5 months per year so some impacts to vegetation from grazing would continue to occur.

Proposed Action

Construction

Terrestrial

Impacts to vegetation from construction under the proposed action alternative, including surface mine facilities, road improvements, and power line and water pipeline construction, include loss of vegetation due to removal and potential heavy dust, and the introduction and potential spread of noxious weeds. Some reclamation would be implemented upon completion of phase 1 to stabilize disturbed areas and reduce erosion with plantings of areas not covered by roads or facilities. More permanent reclamation would be implemented upon completion of the phase 2 construction activities.

The pinyon-juniper vegetation type is not expected to be reduced in trend because of the vast amount of pinyon-juniper habitat located on the Cibola National Forest. As specified in the reclamation plan prepared for the project, revegetation of disturbed areas after construction and operation are complete, would decrease the amount of disturbance and reduce the potential spread of noxious weeds. The spread of noxious weeds could also be controlled by implementing the BMP of cleaning construction equipment before and after leaving the project area.

This project would have no effect to any federally listed plant species and no impact to any Forest Service listed sensitive plant species. A summary of the determination of effects for all USFWS listed species and Forest Service sensitive species with potential to occur on the project site is presented in tables 24 and 25.

Table 24. Summary of USFWS listed plant species determinations for the project area

Common Name	Determination
Plants	
<i>Erigeron rhizomatus</i> , Zuni fleabane	No Effect
<i>Helianthus paradoxus</i> , Pecos sunflower	No Effect

Table 25. Effects determination for Forest Service sensitive plant species found within Mt. Taylor Ranger District, Cibola County, NM

Common Name	Determination for Proposed Action	Species Present	Suitable Habitat Present	Critical Habitat Present
Plants				
Zuni milkvetch	NI ¹	No	No	No
Villous groundcover milkvetch	NI	No	No	No
Chaco milkvetch	NI	No	No	No
Arizona leatherflower	NI	No	No	No
Sivinski's fleabane	NI	No	No	No

¹ NI = No impact to populations, species or habitat

Operation

Terrestrial

Potential impacts to vegetation during phase 1 or phase 2 mining operations under the proposed action alternative would include removal to maintain clearance and safety (reducing potential fire hazard) for ore handling and transport activities. Impacts to vegetation also would include exposure to dust along the periphery of the site and along access haul roads. The introduction of invasive and noxious weeds could also potentially occur. However, BMPs, as outlined in chapter 2, "Best Management Practices," including reseeding disturbed areas, would be employed to reduce the introduction and spread of invasive and noxious weeds. These impacts are not expected to change the trend of the pinyon-juniper vegetation type.

All disturbed areas within the project area would be reclaimed in accordance with the Forest Service guidelines and the specifications outlined in the reclamation plan prepared for the project. Current land use of the project site and surrounding area is primarily for grazing. Wildlife habitat is also present in sections 11, 13, and 14 which includes the site. Reclamation would be implemented in phase 1 and 2, reclamation at the completion of those phases, and final reclamation and closure. Reclamation would include reclamation efforts on lands disturbed during site development, such as growth medium removal, stockpiling, and stabilization.

Final reclamation activities associated with closure would include closure of the portals, escape raise, surface portal facilities, and access roads. The portals would be sealed with concrete, cemented cinder block, or similar material. The inclines would be backfilled with waste rock

material, extending from the portal to outside the actual portal. The escape raise would be closed by placing a concrete slab over the borehole, which would be anchored to solid bedrock. Approximately 4 to 5 feet of rock material would be used to cover the concrete slab. An additional 10 to 15 percent volume of material would be graded to provide drainage from the backfilled area. Approximately 12 inches of growth material would be placed over the top of the rock filled areas and then reseeded to provide vegetative growth. The disturbed areas would be recontoured and graded to blend with the surrounding topography. Regraded areas would be broadcast seeded with a native grass seed mix per specifications of the Forest Service. The footprint area itself will be seeded and the security fence left for approximately 3 years so that vegetation can reestablish without being grazed. State requirements also require vegetation sampling 10 years after reclamation is complete. This reclamation would establish vegetation consistent with the surrounding vegetation type.

As noted above under construction, this project would have no impacts to any federally listed plant species nor to any Forest Service listed sensitive plant species.

Cumulative Effects

Cumulative vegetation effects were evaluated within the area of the escape raise location and its USFS access road, the access roads and mine site at the base of the mesa, the general environs within 1 mile of the mine, and Mt. Taylor. Past vegetative impacts in the project area include livestock grazing, timber harvesting, recreation (e.g., hunting), exploratory drilling, mining, power line construction, logging, recreation, and access roads. Approximately 16.4 acres of direct vegetation loss would occur at the mine site to construct mine facilities. There are no other projects in the immediate vicinity that would contribute to vegetative impacts that are not already described as part of the affected environment. The proposed Roca Honda mine will disturb approximately 180 acres of vegetation as part of that project on Mt. Taylor. The cumulative effects of this and Roca Honda are nearly 200 acres of disturbance. Roads and other future land development activities would contribute to additional and ongoing impacts, although total acres affected are not known. Both mines would reclaim and restore local vegetation at the end of their life.

The proposed action would add 16.4 acres to the ongoing and foreseeable impacts on vegetation. Past and present activities affecting vegetation have been discussed and include forest roads, recreational activity, drilling, minings, and utility lines. The area of project impact on National Forest System lands represents approximately 0.007 percent of pinyon-juniper vegetation type present in Management Areas 13 and 14 of the Mt. Taylor Ranger District. This loss would not change the ratio of pinyon-juniper habitat to other habitats in the Cibola National Forest. Therefore, the cumulative impacts to vegetation, when added to past and reasonably foreseeable future actions, are minor.

Wildlife

Affected Environment

The project area falls within the Great Basin conifer woodland plant community as defined by Dick-Peddie (1993). The ecoregion for the project area is the White Mountains-San Francisco Peaks-Mogollon Rim (McNab and Avers 1994). Typical wildlife within this ecosystem includes mule deer (*Odocoileus hemionus*), elk (*Cervus elaphus*), pinyon jay (*Gymnorhinus cyanocephalus*), black-throated gray warbler (*Dendroica nigrescens*), and plateau striped whiptail

lizard (*Cnemidophorus velox*) recently renamed *Aspidoscelis velox*. The wildlife analysis of this project includes the mine site and escape raise unless otherwise stated.

The pinyon-juniper habitat located within the project area is listed as a wildlife habitat type of concern by the Mt. Taylor Ranger District (Zamora 2009a) because it provides nuts and berries that are readily available forage for many wildlife species, critical winter range for game mammals and birds, travel corridors, thermal cover, dead and down woody material, snags for cavity nesting species, and human created water sources.

Terrestrial

Wildlife observed during the field surveys conducted in 2009 included pinyon jay, common raven (*Corvus corax*), common nighthawk (*Chordeiles minor*), downy woodpecker (*Picoides pubescens*), juniper titmouse (*Baeolophus ridgwayi*), lesser goldfinch (*Carduelis psaltria*), canyon towhee (*Pipilo fuscus*), house finch (*Carpodacus mexicanus*), American robin (*Turdus migratorius*), chipping sparrow (*Spizella passerina*), white-breasted nuthatch (*Sitta carolinensis*), mourning dove (*Zenaida macroura*), Bewick's wren (*Salpinctes obsoletus*), bushtit (*Psaltiriparus minimus*), turkey vulture (*Cathartes aura*), juvenile Swainson's hawk (*Buteo swainsoni*), Gunnison's prairie dog (*Cynomys gunnisoni*), and coyote (*Canis latrans*) (Ecosystem Management, Inc. 2009). The site is used for cattle grazing as designated lease areas so cattle are likely to use the site every year.

Riparian/Aquatic

No perennial stream or aquatic habitat is located within the proposed project area. There is no occurrence of riparian or aquatic wildlife within the project area. The nearest stream, San Mateo Creek, lies 4.5 miles to the west of the mine site.

Federally Listed Threatened and Endangered Wildlife Species

There are six designated USFWS threatened, endangered, or candidate wildlife species known to occur or potentially occur in Cibola County. The bald eagle (*Haliaeetus leucocephalus*) was delisted June 28, 2007, but it is protected by the Bald and Golden Eagle Protection Act. Based on the vegetative, geographical, and topographical characteristics of the project area and the life requisites of the threatened, endangered, and candidate species, it was determined no federally listed species had the potential to occur within the project area. Species considered are listed in table 26.

Forest Service Regional Foresters' Sensitive Species List

A list of sensitive species with potential to occur within the project area was obtained on July 31, 2009, from the U.S. Forest Service (Forest Service). The Forest Service listed 15 sensitive wildlife species that occur or may occur in the Mt. Taylor Ranger District. Based on the vegetative, geographical, and topographical characteristics of the project area, it was determined three sensitive species, Gunnison's prairie dog, spotted bat (*Euderma maculatum*), and gray vireo (*Vireo vicinior*), may occur within the project area (table 27).

Table 26. USFWS listed species with potential to occur in Cibola County, NM

Common Name	Status ¹	Typical Habitat Description	Reason(s) for Analysis or Elimination
Mammals			
Black-footed ferret <i>Mustela nigripes</i>	E	Open grasslands, typically associated with prairie dog colonies.	Not enough habitat in project area to support black-footed ferret; species is extirpated in McKinley County.
Birds			
Yellow-billed cuckoo <i>Coccyzus americanus</i>	C MBTA	Broadleaf riparian forest	No suitable habitat within or near project area.
Southwestern willow flycatcher <i>Empidonax traillii extimus</i>	E MBTA	Dense, shrubby riparian habitats, typically in close proximity to surface water or saturated soils .	No suitable habitat within or near project area.
<i>Haliaeetus leucocephalus</i> Bald eagle	BGEPA MBTA	Large trees along rivers, lakes, or reservoirs for roosts and nests; riparian and upland habitats for foraging.	No suitable habitat within or near project area.
Mexican spotted owl <i>Strix occidentalis lucida</i>	T MBTA CH	Mature ponderosa pine and mixed conifer forest, typically associated with steep slopes and cliff/canyon complexes.	No suitable habitat within or near project area.
Fish			
Zuni bluehead sucker <i>Catostomus discobolus</i>	C	Shaded, pool and riffle habitats with coarse substrates; only found in one location in the Zuni Mountains.	No suitable habitat within or near project area.

BGEPA = Bald and Golden Eagle Protection Act; C = Candidate, E = Endangered, MBTA = Migratory Bird Treaty Act, T = Threatened, CH = Designated Critical habitat.

Sources: USDI FWS 2010; NMGFD 2010.

Table 27. Region 3 Forest Service sensitive species with potential to occur in Mt. Taylor Ranger District

Name	Typical Habitat Description	Reason(s) for Analysis or Elimination
Mammals		
Merriam's shrew <i>Sorex merriami leucogenys</i>	Grasslands, sagebrush scrub, pinyon-juniper woodlands, mixed conifer woodlands.	Suitable habitat is located within or near project area. Need to do the analysis since it is in pinyon-juniper and big sage habitat.
Dwarf shrew <i>Sorex nanus</i>	Grasslands, chaparral, bare rock/scree, mixed conifer woodlands.	No suitable habitat within or near project area.
Spotted bat <i>Euderma maculatum</i>	Highly varied habitats from coniferous forest to desert scrub; roosts on cliffs and rock crevices.	Discussed in "Environmental Consequences" section.

Name	Typical Habitat Description	Reason(s) for Analysis or Elimination
Gunnison's prairie dog <i>Cynomys gunnisoni</i>	Level to gently sloping grasslands, semidesert and montane shrublands (6,000–12,000 feet).	Discussed in "Environmental Consequences" section.
Cebolleta southern pocket gopher <i>Thomomys bottae paguatae</i>	This species occurs in the vicinity of the village of Cebolleta, Cibola County, on the Rio Paquate on the southeast side of Mt. Taylor. Gophers were collected only in the areas of the flood plain that were, or had been, under cultivation.	No suitable habitat within or near project area.
Mt. Taylor northern pocket gopher <i>Thomomys talpoides taylori</i>	This species has been collected in the pine and fir belts above 8,500 feet about 6 miles northeast of the summit of Mt. Taylor, and on the southwest slope of Mt. Taylor.	No suitable habitat within or near project area
Birds		
Bald eagle <i>Haliaeetus leucocephalus</i>	Mature shoreline forests with scattered openings and little human use, near water with abundant fish and waterfowl.	No suitable habitat within or near project area.
Northern goshawk <i>Accipiter gentilis</i>	Ponderosa pine, mixed conifer, and spruce-fir forests.	No suitable habitat within or near project area.
American peregrine falcon <i>Falco peregrinus anatum</i>	Rocky, steep cliff areas, generally near water or mesic canyons.	No suitable habitat within or near project area.
Western yellow-billed cuckoo <i>Coccyzus americanus occidentalis</i>	Open riparian woodlands and broad-leaf forests.	No suitable habitat within or near project area.
Gray vireo <i>Vireo vicinior</i>	Thorn scrub, oak-juniper woodland, pinyon-juniper, dry chaparral, mesquite, and riparian willow habitats.	Discussed in "Environmental Consequences" section.
Amphibian		
Northern leopard frog <i>Rana pipiens</i>	Wetlands with abundant aquatic vegetation and perennial water source.	No suitable habitat within or near project area.
Crustaceans		
Clam shrimp <i>Eulimnadia follisimillis</i>	Vernal and ephemeral pools	No suitable habitat within or near project area.
Fairy shrimp <i>Streptocephalus n. sp.</i>	Vernal and ephemeral pools	No suitable habitat within or near project area.
Fish		
Rio Grande sucker <i>Catostomus plebeius</i>	Currently inhabits the northern portion of the Rio Grande and its tributaries.	No suitable habitat within or near project area.
Zuni bluehead sucker <i>Catostomus discobolus yarrowi</i>	Found primarily in shaded pools and pool-runs, about 0.3 to 0.5 m deep with water velocity less than 10 cm/s. Species now restricted to several small, semi-isolated areas in the Zuni Mountains on the Mt. Taylor Ranger District.	No suitable habitat within or near project area.

Source: NMGFD 2010.

Merriam's shrew is not known to occur in the project area and was not observed during surveys conducted for this species, but pinyon-juniper and sagebrush is considered suitable habitat. This is one of the least known of all shrew species. It is extremely rare, with hundreds of pitfall trap/baited small mammal trap hours needed to capture one individual. In addition the species is extremely difficult to identify and only close, microscopic examination of the teeth will allow experts to identify it with certainty.

Gunnison's prairie dog has been documented in valleys and plateaus of the Intermountain West and upper drainage basins east of the Continental Divide. Gunnison's prairie dog is known to occur east and west of the Continental Divide in New Mexico. Gunnison's prairie dogs typically inhabit grasslands from low valleys to montane meadows (Findley et al. 1975), and sagebrush habitat with big mountain sagebrush found below mesas. The project area includes open rangeland dominated by sagebrush along Forest Road 450 (FR 450).

The **spotted bat** has been documented to use a variety of habitats from coniferous forests to desert scrub. The spotted bat is known to use cliff faces and rock crevices as roost sites, and is known to occur on Mt. Taylor. The proposed project area includes potential roost sites within the crevices of the cliff face.

The **gray vireo** is known to inhabit pinyon-juniper woodlands.

High Priority Migratory Bird Species

The Cibola National Forest 2008 Breeding Bird Survey (BBS) report provides a summary of the potential occurrence of priority bird species by habitat type. Information from the report is based on three breeding bird surveys on the Cibola National Forest of which four priority bird species may be found within the project area. High priority migratory birds are determined by consulting several lists including the National Audubon Society Watchlist, the USFWS's Birds of Conservation Concern, the New Mexico Comprehensive Wildlife Conservation Strategy (CWCS) Species of Greatest Conservation Need (SGCN), the Partners in Flight (PIF) Continental Plan, and the New Mexico PIF list. Those species potentially occurring in habitats similar to the project area on the Mt. Taylor Ranger District were reviewed. Table 28 summarizes species and habitat analyzed.

Table 28. High priority migratory bird species and associated habitat

Priority Bird Species	Habitat
Pinyon jay	Pinyon-juniper (p-j) woodland is used most extensively by this species but flocks also breed in sagebrush, scrub oak, and chaparral communities.
Black-throated gray warbler	This species can be found in p-j with some oak understory between 7,000 and 8,000 feet, but it can also be common in more mesic p-j with a high canopy closure.
Band-tailed pigeon	This species may be found from p-j up through spruce/fir depending on availability of food that includes a wide variety of mast such as fruits and nuts, especially acorns and pinyon pine nuts.
Gray flycatcher	This species is found in p-j woodland up into the fringes of ponderosa pine, together with some understory of oak, mountain mahogany, etc., and often in semimixed xeric conditions.

Sources: Balda 2002; Cibola National Forest 2008; Guzy et al. 1997; Keppie et al. 2000; Sterling 1999.

On the Cibola National Forest, populations of birds are monitored through the use of BBSs on geographic areas to detect population and trend during the breeding period. There are two types of breeding bird surveys conducted on the Cibola National Forest and both types of survey routes are run on the Mt. Taylor Ranger District. The Mt. Taylor BBS route in the San Mateo Mountains is approximately 3.5 miles southeast of the proposed mining area. There are no important bird areas (IBAs) or critical overwintering areas for migratory birds in the analysis area.

The **pinyon jay** has been detected on the USGS Mt. Taylor, McGaffey and Bluewater BBS routes.

Pinyon jays are the highly social, cooperative breeding, seed caching bird of the foothills and lower, mountain slopes of the western and southwestern United States. Although omnivorous, this species is committed to the harvest, transport, caching, and later retrieval of pine seeds, aided by a relatively long, strong bill, an expandable esophagus, and long, strong wings (Balda 2002). Pinyon-juniper woodland is used most extensively but flocks also breed in sagebrush, scrub oak, and chaparral communities. In parts of its range, they inhabit ponderosa forests. Their diet also includes acorns, juniper berries, other wild berries, cultivated grains (including sunflower seeds and other commercially supplied seeds from bird feeders), arthropods, lizards, snakes, nestling birds, and small mammals (Balda 2002).

The **black-throated gray warbler** has been detected on the USGS Mt. Taylor, and Bluewater BBS routes. It has also been detected on the shorter Cibola forest routes at Rinconada and Limekiln.

This small gray warbler of southwestern Rocky Mountain states has been described in numerous accounts as shy, retiring, and not easy to observe. The combination of these traits, in addition to slow progress in describing the natural history of its steep-sloped, xeric pinyon-juniper and oak woodland-dominated habitat, has helped make it one of the most overlooked warblers in North America. In New Mexico, it breeds in mountains in the northern portion of state, along the Mogollon Rim in the southwest, and locally at scattered other locations in central and western New Mexico. The warbler is more widespread in southwest ranges than previously described, occurring in the Magdalena and Caballo Mountains, through the Black Range, and in any appropriate habitat in the Gila Wilderness (Guzy and Lowther 1997).

On the Mt. Taylor Ranger District this species is found in pinyon-juniper with some oak understory in elevation varying between 7,000 and 8,000 feet, but can be common in more mesic pinyon-juniper with high canopy closure. Black-throated gray warblers are typically found breeding in pinyon-juniper and oak woodlands, but are associated with other vegetation types as well. They are also found in New Mexico during all migrations, where they are seen in pine habitats of mountainous regions as well as in cottonwood and willow dominated riparian areas. Their diet consists of lepidopteran larvae (caterpillars), and they have also been observed catching flying insects, along with spiders, carpenter ants, stinkbugs, and weevils (Guzy and Lowther 1997).

The USGS Bluewater and Mt. Taylor BBS, commonly detects the **band-tailed pigeon**. The band-tailed pigeon is absent from the USGS McGaffey BBS route. It is not found on any of the other shorter BBS routes within the district.

In the United States, band-tailed pigeons inhabit montane conifer or mixed species forest dominated by pines and oaks from 5,500 to 8,900 feet in elevation (one nest has been found at

approximately 11,500 feet), above snowline in New Mexico); it is generally absent from intervening, large, lower elevation desert scrub community except for over flying and localized feeding. They occupy pine, Douglas-fir forest, and western and southwestern spruce-fir communities. They are also found in oak-juniper and juniper-pinyon communities in New Mexico (Keppie and Braun 2000). On the Mt. Taylor Ranger District, they may be found from pinyon-juniper up through spruce/fir, depending on availability of food that includes a wide variety of fruits and nuts, especially acorns and pinyon pine nuts (Cibola 2008).

The **gray flycatcher** has been detected on the USGS Mt. Taylor, McGaffey, and Bluewater BBS routes, and the shorter Cibola forest route at Limekiln.

The gray flycatcher is a common inhabitant of arid woodland and shrub lands of the interior western U.S. in summer and northern Mexico in winter. Their habitat varies from sagebrush to pinyon-juniper woodland to ponderosa pine forests. Their breeding range is generally large sagebrush, often in association with antelope brush, rabbit brush, mountain mahogany, pinyon pine, juniper, and/or ponderosa pine (Sterling 1999). On the Mt. Taylor Ranger District this species is found in pinyon-juniper woodland and up into the fringes of ponderosa, together with some understory of oak, mountain mahogany, etc., and often in semimixed xeric conditions. This species occurs from about 6,800 to nearly 8,000 feet but not in uniform distribution (Cibola 2008). Their feeding habitat consists mostly of catching insects in flight or from gleaning insects off the ground, foliage, tree bark, and branches (Sterling 1999).

Management Indicator Species (MIS)

The “Cibola National Forest Land and Resource Management Plan,” adopted in July 1985, amended May 1990, and updated in 2011, identified 13 management indicator species (MIS) (Cibola LRMP) for 10 different habitat types. All 13 potential MIS were considered for the La Jara Mesa Project. This MIS analysis is tiered from the 2011 forestwide MIS report. Some species are considered for two different habitat types. Three species—elk, mule deer and juniper titmouse—were determined to potentially occur within the project area (Zamora 2009a). Table 29 presents a summary of the species cited above for this EIS.

Table 29. Summary of Forest Service management indicator species (MIS) evaluated for the La Jara Mesa Uranium Mining Project

Common Name	Habitat Indicator Listing Rationale	Habitat Description	Acres of Habitat Present in Project Area	Analysis in Impacts Section?
Elk	Mountain Grassland/ mixed conifer	In general, elk prefer open grassy meadows located less than ½ mile from water. Hiding cover for elk occurs in stands of trees 30-60 acres in size with 70 percent canopy cover.	16.4	Yes
Mule deer	Mountain shrub/ Pinyon-juniper	Early stages of plant succession with an abundance of browse plants are more beneficial to mule deer than late stages. Mixtures of plant species are preferable to single species plant communities. Food requirements for deer average about 5 to 7 pounds of green forage per day	16.4	Yes

Common Name	Habitat Indicator Listing Rationale	Habitat Description	Acres of Habitat Present in Project Area	Analysis in Impacts Section?
		depending on the size of the deer. Mule deer depend on early growing grasses and forbs in the spring and forbs in summer.		
House wren	Riparian	House wrens are common in shrubs and brushy habitats and often nest in cavities although a variety of nest substrates are used; they are insectivorous. The breeding season is May through July and this species is strongly territorial.	0.0	No
Juniper titmouse	Pinyon-Juniper	The juniper titmouse prefers warm, dry habitats of open pinyon-juniper woodland sometimes mixed with oak. It is most common where juniper is dominant and where large, mature trees are present to provide cavities for nesting.	16.4	Yes
Red-breasted nuthatch	Spruce-fir	This species typically occurs in mature and diverse stands of coniferous forest, especially where spruce, fir, and pine are present, and less frequently in pure stands of pine. May also breed in mixed woodlands when a strong coniferous component is associated with deciduous trees such as aspen and oak.	0.0	No
Black bear	Spruce-fir/mixed conifer	Bears are omnivorous and opportunistic with a diet which varies according to seasonal availability of foods. They eat spring grass, berries, acorns, nuts, dead animals, and can occasionally be predators of livestock and other animals. Most forested areas are populated by black bear. They need woodland cover preferring mixed forests with food producing trees such as oak or pinyon. Bears are frequently found near water.	0.0	No
Pygmy nuthatch	Ponderosa pine	The pygmy nuthatch is a primary cavity nester and prefers mature and old growth ponderosa pine and potentially adjacent mixed conifer as well. This species breeds from May to July and maintains a territory of 1-5 acres. Food consists of seeds, cones, spiders, larva, and insects. Removal of snags has been shown to reduce densities of pygmy nuthatches.	0.0	No
Hairy woodpecker	Mixed conifer	Hairy woodpeckers are primary cavity excavators found in several habitat types with a larger diameter snag component. Limiting factors for hairy woodpecker appear to be availability of snags (greater than 15" d.b.h.) within the mixed-conifer forest. Soft snags are often preferred. The hairy woodpecker is omnivorous preferring insects but using fruits and seeds in fall and winter. This species breeds from May through July.	0.0	No

Common Name	Habitat Indicator Listing Rationale	Habitat Description	Acres of Habitat Present in Project Area	Analysis in Impacts Section?
Red-naped sapsucker	Deciduous forest	This species breeds in deciduous and mixed forests including aspen groves, open ponderosa pine forests, aspen-fir parklands, logged forests where deciduous groves remain, montane coniferous forest, and occasionally subalpine forest edges. This habitat type is an inclusion of aspen in the mixed conifer vegetation type and as such did not show up in the general vegetation layer in the geographic information system (GIS) library. It is included here as a baseline for species dependent on deciduous forests.	0.0	No
Merriam's wild turkey	Ponderosa pine	Merriam's turkey is generally found in ponderosa pine, gambel oak, and pinyon-juniper woodland. Nest sites are generally located along edges of small forest openings and within ½ mile of streams or other water sources. Slopes greater than 50 percent are preferred for nesting, loafing, and roosting. Residual cover provided by grass, deciduous shrubs, or woody slash is important near nests and for brood rearing areas.	0.0	No
Long-billed curlew	Plains grassland	This species nests primarily in short grass or mixed prairie habitat with flat to rolling topography. Habitats with trees, high density shrubs, and tall, dense grass are generally avoided.	0.0	No
Grasshopper sparrow	Plains grassland	The grasshopper sparrow prefers moderately open grasslands and prairies with patchy bare ground; they select different components of vegetation, depending on grassland ecosystem of the southwest and west but select sparser vegetation in the east and midwest, e.g., tall grass and shortgrass prairie.	0.0	No
Rio Grande turkey	Eastern Riparian	The Rio Grande turkey occupies semiarid uplands and riparian areas. It is mostly found in shinnery oak and mid-grass prairie. Principal roost tree species which are usually located in more mesic sites are shinnery oak, pecan, American elm, red cedar, net leaf hackberry, and cottonwood.	0.0	No

Sources: USDA Forest Service 1985; NMGFD 2010.

Environmental Consequences

Measures to be analyzed for wildlife include habitat loss, displacement, and disturbance for the following category of species: (1) threatened/endangered or sensitive species (TES) with determinations of effect for each species; (2) management indicator species (MIS) with population and habitat trend determinations for each species and their associated habitat at the forestwide and project level; and (3) migratory birds with determinations of “take” as defined by the Migratory Bird Treaty Act and effects to important bird areas and important overwintering areas.

No Action Alternative

Under the no action alternative, the project would not be constructed and there would be no impacts to wildlife from the project. The current Forest Service management plans and adjacent private owners would continue to guide management of the project area. Activities affecting wildlife and wildlife habitat would continue to include 4-wheel drive vehicle activities, hunting, and livestock grazing. There would be no additional effects to wildlife species as a result of the no action alternative.

Proposed Action

Construction and Operation

Terrestrial

Foreseeable effects to wildlife from the proposed project construction include possible disturbance from increased noise from the construction and mining activities, degradation and/or loss of habitat due to loss of vegetation that may provide forage and cover, and incidental mortality or displacement of small animals. Construction and widening of roads would fragment habitat and increase potential mortality due to collisions with vehicular traffic. Wildlife, if present during construction, may be displaced to adjacent habitat surrounding the project area during construction operations. This will result in loss of such wildlife if adjacent habitat is already at carrying capacity.

Noise disturbance from blasting would be obvious and noticeable for approximately 1 week at the mine face and into the mine until the blasting moved further into the mine. Continued noise emissions would last until the noise emissions were reduced by the absorption of the mine itself. Noise emissions from blasting may cause wildlife species to temporarily disperse from the project area and to avoid the project area until blasting is completed. The pinyon-juniper habitat is widespread in the surrounding area covering approximately 239,155 acres within the management areas of the proposed project area.

The impact analysis boundary for raptors was a half mile buffer around the portal surface facility, road improvements, power line, and escape raise. Foreseeable effects to raptors from the proposed construction of the power line would include the potential for incidental mortality due to electrocution or collision from the new distribution line. This risk has been reduced because the power line would be designed as raptor safe.

Field studies conducted for this EIS found no protruding ledges on the cliff face to provide potential raptor nesting habitat in the project area's footprint. The cliff face extends beyond the footprint of the project area, which may provide nesting habitat for raptors. A juvenile Swainson's hawk was observed perched on a rock adjacent to the cliff face (Ecosystem Management, Inc. 2009). New Mexico Department of Game and Fish (NMDGF) recommends conducting a raptor nesting survey within half a mile of the project area and resurveying for nesting activity prior to construction. Reclamation of the portal, escape raise, and surface portal facilities would establish a vegetative community that would provide wildlife habitat. The reclamation would be implemented in phases, phase 1 and 2 reclamation at the completion of those phases, and final reclamation and closure. Reclamation would include reclamation efforts on lands disturbed during site development, such as growth medium removal, stockpiling, and stabilization. In addition, stormwater and sediment controls (i.e., diversion ditches, sediment traps/detention

basins) would be constructed to minimize potential erosion and sediment loading during mining operations.

Federally Listed and Forest Service Sensitive Species

No federally listed species or their critical habitat exists in the project area. The proposed construction of the surface facilities and infrastructure could potentially affect four Forest Service sensitive wildlife species: Gunnison's prairie dog, spotted bat, Merriam's shrew, and the gray vireo. A summary of the determination of effects made for this EIS for all USFWS protected species, the bald eagle, and Forest Service sensitive species with potential to occur on the proposed project area is presented in tables 30 and 31.

Table 30. USFWS federally listed species considered in the analysis area and summary of effects determinations

Common Name	Determination
Mammals	
Black-footed ferret, <i>Mustela nigripes</i>	No Effect
Birds	
Yellow-billed cuckoo, <i>Coccyzus americanus</i>	No Effect
Southwestern willow flycatcher, <i>Empidonax traillii eximius</i>	No Effect
Bald eagle, <i>Haliaeetus leucocephalus</i>	No Effect
Mexican spotted owl, <i>Strix occidentalis lucida</i>	No Effect
Fish	
Zuni bluehead sucker, <i>Catostomus discobolus</i>	No Effect

Table 31. Summary of Forest Service sensitive species found within Mt. Taylor Ranger District, Cibola County, NM, and determination of effects

Common Name	Determination for Proposed Action	Species Present	Suitable Habitat Present	Critical Habitat Present
Mammals				
Merriam's shrew	MI*	No	Yes	No
Dwarf shrew	NI**	No	No	No
Spotted bat	NI	No	No	No
Gunnison's prairie dog	MI	Yes	Yes	No
Cebolleta southern pocket gopher	NI	No	No	No
Mt. Taylor northern pocket gopher	NI	No	No	No
Birds				
Bald eagle	NI	No	No	No
Burrowing owl	NI	No	No	No

Common Name	Determination for Proposed Action	Species Present	Suitable Habitat Present	Critical Habitat Present
Northern goshawk	NI	No	No	No
American peregrine falcon	NI	No	No	No
Bald eagle	NI	No	No	No
Burrowing owl	NI	No	No	No
Gray vireo	MI	No	Yes	No
Western yellow-billed cuckoo	NI	No	No	No
Amphibian				
Northern leopard frog	NI	No	No	No
Fish ***	NI	No	No	No
Crustaceans	NI	No	No	No

*MI = May impact population, species, or habitat.

**NI = No impact to populations, species, or habitat.

*** Fish – There are no perennial springs, seeps, or streams within the project area. Neither the species nor its habitat occur within the project area or would be impacted by the project.

Although **Merriam's shrew** is not known to occur in the project area and was not observed during surveys, vegetation removal during project construction and road widening may remove suitable or occupied habitat of this shrew. While there is a chance the proposed project may impact individuals of this species, it is not likely that any impacts to habitat or individuals would result in a trend toward Federal listing since it is not known to occur in the project area.

Gunnison's prairie dog towns were observed inside the 200-foot survey boundary along FR 450, but are located outside the proposed right-of-way (ROW) of 18 feet. The ROW footprint should not negatively impact Gunnison's prairie dog, because the road improvements include widening the road to an 18-foot width, and the prairie dog towns observed were located outside the proposed ROW. Potential indirect impacts would be increased human disturbance resulting from increased use of FR 450. Although there is a chance the proposed project may impact individuals of this species such as being hit by vehicles, it is not likely that any impacts to habitat or individuals would result in a trend toward Federal listing.

The **spotted bat** is not expected to be affected by the project. There are no permanent water bodies or stock tanks within the project area to provide the spotted bat with foraging habitat. The closest water body is the San Jose River, which is approximately 7 miles southwest of the project area.

Although there is a chance the proposed project may impact individuals of this species, it is not likely that any impacts to habitat or individuals would result in a trend toward Federal listing.

The **gray vireo** was not observed in the project area during surveys. The gray vireo is known to inhabit pinyon-juniper woodlands. The proposed project area is located within pinyon-juniper woodland habitat and would impact approximately 16.4 acres. The proposed project construction would require the removal of some shrubs, juniper, and native grasses. The footprint of the

proposed project would result in negligible impacts when compared to the 239,155 acres of pinyon-juniper woodland habitat located within the management areas of the project area. Potential operation impacts would include increased disturbance resulting from increased vehicle use of FR 450. Although there is a possibility that the proposed project may encounter individuals of this species, it is not likely that any impacts to habitat or individuals would result in a trend toward Federal listing. To minimize impacts to this species, vegetation removal will occur outside the breeding season. NMDGF recommends conducting gray vireo surveys to determine the presence/absence of this species within the project area. Such analysis might occur as part of the sampling and analysis plan if required by the State.

High Priority Migratory Bird Species

The proposed portal surface facility, road use and improvements, power line construction, and escape raise could potentially affect four high priority migratory bird species, which include the pinyon jay, black throated gray warbler, band-tailed pigeon, and gray flycatcher (Zamora 2009b). There are no designated important bird areas or overwintering areas located within the project area for the Mt. Taylor Ranger District. Implementation of the proposed project could impact birds in the immediate project area and the surrounding habitat. Implementation could result in unintentional take through nest abandonment or destruction as a result of construction activities. This impact is not expected to reduce population trends, because the project area is small in size and actual surface disturbance is approximately 16.4 acres. Mining activity would be taking place underground. There are many acres of adjacent suitable habitat for birds to inhabit in the area.

If the project starts before the birds are able to nest, the disturbance in the area could keep birds from nesting or result in abandoning their young. If the project starts after nesting birds return to the area, then they may abandon their nest due to disturbance from the proposed project resulting in unintentional take. Once the project starts it would be a year-round activity and disturbance could occur all times of the year. These impacts are not expected to cause a decline in populations of the four listed high priority migratory bird species. There is suitable habitat surrounding the project area and within the district for birds to nest successfully. Due to the relatively small 16.4-acre disturbance area and mitigation measures to avoid construction during the breeding season provided as part of the project, potential impacts to high priority bird species or migratory birds are anticipated to be negligible.

Management Indicator Species (MIS)

Three MIS species, elk, mule deer, and juniper titmouse, could be impacted by the proposed project (Zamora 2009b).

Elk and mule deer are known to use the La Jara Mesa top and the associated slopes as part of their winter range and the area below the mesa as a travel corridor (personal communication Craig Sanchez, NMDGF). As a result of the proposed project, both species could be displaced due to human activity, noise disturbance, and direct habitat loss. Elk or deer could be struck by road traffic, and their effective habitat could be reduced if they avoid the road while it is being used. Forest Service staff have stated that such avoidance can occur up to 700 meters away from the road. There is suitable habitat surrounding the project area that elk and mule deer can use for foraging, bedding, and hiding cover. Summer habitat may be less impacted than winter because the project area is primarily winter habitat for elk and mule deer. Approximately 0.1 acre of direct winter habitat loss would result from the escape raise construction, and approximately 16.3 acres of travel corridor would be directly lost as a result of the proposed project. The proposed action

alternative is not expected to impact elk or mule deer to the point of declining populations or habitat trends forestwide (Zamora 2009b). The project will remove approximately 0.007 percent of the pinyon-juniper vegetation present in Management Areas 13 and 14 of the Mt. Taylor Ranger District. The Cibola National Forest contains 838,376 acres of pinyon-juniper habitat.

Juniper titmouse is known to occur in open pinyon-juniper woodland habitat. This species is most common where juniper is dominant and large, mature trees are present to provide cavities for nesting. The project area is located in pinyon-juniper woodland habitat, and did include scattered juniper trees that may be suitable for nesting. Individuals may be displaced from the project area due to human activity, noise disturbance, and direct habitat loss. There is suitable pinyon-juniper habitat surrounding the project area that juniper titmouse could use for foraging and cover. The proposed action alternative is not expected to cause juniper titmouse population trends to decline on the forestwide scale (Zamora 2009b). The pinyon-juniper habitat type loss of 16.4 acres is not expected to reduce the pinyon-juniper habitat trend on the forestwide scale, because of the vast amount of pinyon-juniper habitat located within the forest (Zamora 2009b).

During operation, impacts to wildlife would result from mining activity and equipment, vegetation removal, power line and road improvements, and reclamation efforts. Increased noise from the traffic due to the mining activity and equipment, reclamation efforts, road improvements, and vegetation removal may displace wildlife to adjacent areas. Wildlife displaced to adjacent areas may experience disruption in their mating, nesting, and foraging behavior, which could potentially affect reproductive success and survival for some individuals. Incidental mortality among small animals may occur on the project area. Incidental mortality to raptors may occur with power line collisions, but may be minimized as long as the power line is a raptor-safe design. However, these impacts are not expected to cause a decline in populations of wildlife, since suitable habitat surrounds the project area and most wildlife are expected to migrate a distance away from the project where they are no longer disturbed. Migration of wildlife into adjacent areas may affect wildlife populations already occupying those areas. Due to the 16.4 acres of disturbance compared to the 239,155 acres of pinyon-juniper woodland habitat located within the management areas of the proposed project area, population densities are expected to accommodate the migration of wildlife into these areas. All disturbed areas would be revegetated according to the specifications outlined in the reclamation plan prepared for the proposed project. As seeded vegetation becomes established on reclaimed surfaces, the wildlife may begin to move back into the area after operations cease.

The pinyon-juniper habitat type is not expected to be reduced in trend because of the vast amount of pinyon-juniper habitat located on the Cibola National Forest. As specified in the reclamation plan prepared for the project, revegetation of disturbed areas after construction and operation are complete would decrease the amount of disturbance and reduce the potential spread of noxious weeds. The spread of noxious weeds could also be controlled by implementing the BMP of cleaning construction equipment before and after leaving the project area.

Cumulative Effects

Cumulative effects to wildlife mirror those to vegetation. Past impacts to the pinyon-juniper woodland in the project vicinity include livestock grazing, timber harvesting, recreation (e.g., hunting), exploratory drilling, mining, power line construction, timber harvesting, recreation, and access road construction. Most of these are currently passive activities except for hunting and livestock grazing. The proposed portal surface facility, road improvements, power line

construction, and escape raise shaft would add a 16.4-acre direct impact on the pinyon-juniper and wildlife habitat during the life of the project. The pinyon-juniper habitat is widespread in the landscape surrounding the project area, and the cumulative effect of an additional 16.4 acres would not be significant. The 16.4 acres of disturbed vegetation would be reclaimed at the end of mining operations, thus reducing the proposed project's footprint. Impacts to wildlife within the project area would last until the mining operation ends and reclamation of the disturbed areas are restored with vegetation.

No known activities are proposed for the study area although another uranium mine is proposed near the north side of Mt. Taylor that would contribute to wildlife impacts to Mt. Taylor as a whole.

The proposed action in combination with past, present, and foreseeable future actions that may result in increased impacts to the pinyon-juniper habitat or to individuals would not create significant cumulative impacts to wildlife species, including any Forest Service listed sensitive or MIS habitat or population trends. The proposed action would also not significantly change the listed high priority migratory bird species habitat or population trends. Therefore, no significant cumulative impacts are expected to occur to wildlife species, including any Forest Service listed sensitive, MIS, or migratory bird species or their habitat.

Rangeland Resources

Affected Environment

Livestock grazing has been a historic and traditional use of Cibola National Forest (CNF) lands in and around the project area. The U.S. Forest Service (Forest Service) Handbook 2209 (USFS 2000) forms the basis for the grazing administration program, including developing permit terms and conditions. For the CNF, grazing management strategies are incorporated in the "Cibola National Forest Land and Resource Management Plan" (Cibola National Forest USFS 1985).

The 0.1 acre proposed escape raise shaft would be located within the 40,309-acre El Rito allotment (No. 02208) and 8,117-acre La Jara pasture (No. 001). The proposed 16.4-acre portal surface facilities, power line, and road improvement would be located within the El Rito allotment and the 19,148-acre Lobo Canyon pasture (No. 003).

As part of its planning process, the CNF determines capability, suitability, and rangeland condition and then administers livestock permits on various allotments through site specific allotment management plans (AMPs). The AMPs include livestock rotation schedules, utilization requirements, planned structural and non-structural improvements, maintenance standards, and tentative grazing capacities. Site specific standards are also included in the annual operating instructions (AOIs) issued annually to livestock permittees. Typical AOIs include approximate numbers and rotation dates for grazing through the season.

Grazing is allowed 5 months per year in the project area allotment, from June 1 through October 31. There are two permittees that graze 130 and 133 cattle, respectively, on the allotment. The cattle are trucked or trailed into the allotment. There are no range improvements within the project area. The proposed water well, pump station, and access road would be located on the private Elkins Ranch property, which is also subject to livestock uses. Grazing on private land is based upon a given landowner's preferences. Detailed records (of amount, type of use, etc.) are not necessarily available to the public.

Environmental Consequences

No Action Alternative

Under the no action alternative, current management of grazing practices and the resulting effects on vegetation and range condition would continue. Cattle would continue to graze on forest lands and private lands in the future.

Proposed Action

Construction

Construction activities would result in a loss of approximately 16.4 acres of forage area in the surface footprint of the mine during construction of phases 1 and 2. Blasting, drilling, and traffic could alarm livestock and constrain some livestock movement if initial mine development construction occurs between June 1 and October 31. Blasting effects would be most pronounced for the first few days of opening of the adit in phase 1. Thereafter, blasting would be inside the mine and the noise emissions muffled by the mine tunnel. Impacts to livestock would be temporary and minor. Cattle would be at risk from cars and trucks driven on the access roads.

Operation

The mine site land would be unsuitable for grazing during the time period associated with mining and reclamation. Surface facility sites would be fenced and grazing precluded. The predicted loss of suitable acres for grazing and as a result, direct animal unit month (AUM) losses, would be confined to the disturbed area footprints. The roadways are already cleared and unsuitable for grazing. Indirect losses of AUMs could occur due to restricted access with the lease areas. Once disturbed areas associated with mining have been reclaimed and their rangeland capacity restored (as determined by the Cibola National Forest via restoration criteria), they would again be suitable for livestock grazing. No range improvements would be affected by the proposed project.

The proposed project would remove approximately 16.4 acres of vegetation within the grazing allotment and these areas would be unsuitable for grazing for the life of the project. The impact to grazing resources from the temporary loss of acreage within allotments would be short term (i.e., for grasses and forbs) and negligible as the acres of vegetation that would be removed represent only 0.04 percent of the allotment. There would be no direct loss of AUMs.

No water sources for livestock watering would be temporarily or permanently affected by the operation of the mine. The water quality of those sources would not adversely affect livestock. Fencing would exclude livestock from the surface facilities. Trucks hauling ore on the roads and other mining operation vehicles, including commuting workers, would increase the risk of livestock being struck by vehicles. However, gates would restrict some livestock movement, and the likelihood of cattle being struck on the road would be small. Visibility is reduced at night, which would increase that likelihood in the summer when nighttime grazing is more common.

Cumulative Effects

Cumulative effects to grazing in the project vicinity occur from mining and timber harvesting and are evaluated within the allotments affected by this project. Recreation and road building can also affect grazing but to a negligible extent compared to the other two land uses. Past activities in the project vicinity include grazing, exploratory drill pads, power lines, access roads, logging, and recreation. Mining operation disturbance can affect a grazing allotment by directly disturbing the

ground surface within the mining area. Within this footprint area, all forage vegetation covered or excavated by the project would be removed until reclamation of the disturbed area restores the forage resource. Grazing on the reclaimed areas would be restricted by retaining the proposed fences until the agencies determine they are ready for grazing.

In addition to the temporary restriction on grazing within the mine footprint, mine roads can also restrict movement within an allotment. The project would disturb 16.4 acres which is 0.04 percent of the area of the El Rito allotment. When combined with past, present, and other foreseeable disturbances in the project vicinity, the total disturbance would be minor. No known future activity would create movement barriers for livestock that would be cumulative to the fencing around the escape raise and the portal surface facilities. Another potential effect on grazing in the project vicinity is water availability. There would be no reduction or elimination of water sources for stock water either temporarily or permanently. When added to past, present, and future activities in the project vicinity, there would be minor cumulative effects due to haul road construction improvements or mining operations interfering with trailing routes or trucking of livestock. Impacts to grazing would be generally temporary; disturbed areas would again be suitable for grazing after they have been reclaimed. Because there are no reasonably foreseeable future activities in the allotments evaluated for rangeland impacts, there would be no cumulative effects to grazing resources.

Energy and Natural Resources

Affected Environment

The Forest Service has concluded that this project is not likely to have any significant impacts to energy consumption or impacts to natural resources, other than those (vegetation, surface water, uranium removal) discussed in this EIS. The uranium that is located at the La Jara Mesa site is a natural resource which can be mined and recovered as authorized by the General Mining Act of 1872. Therefore, in compliance with NEPA to focus the scope of the EIS to significant issues, this section is limited to this statement.

Environmental Consequences

No Action Alternative

Under the no action alternative, fuel used for commuting and construction and materials such as steel, concrete, and other supplies would not be consumed. Uranium ore would not be mined and recovered, and uranium from this source would not be used to power nuclear power plants or for other uses.

Proposed Action

Construction and Operation

Fuels would be used to power employee vehicles and trucks and project equipment. Energy, including electrical energy, would be consumed to operate the mine and to process the ore at an offsite location. The ore, if converted into uranium fuel rods, would be used to generate electric energy at a nuclear power plant. Therefore, there is no significant adverse consumption of natural resources from this project as resource recovery is the purpose of the project. The project would make a positive impact on the rate of fossil fuel energy consumption if the uranium produced from the mine were used to generate electricity in nuclear power plants.

Cumulative Effects

Cumulative effects on energy and natural resources are considered at the project and for the county as a whole. There are no other past, present, or reasonable foreseeable activities proposed in the project vicinity or in the county that would create any excessive demands on energy; nor are there any that would create any impacts to natural resources, other than mining activities designed to recover uranium ore. Cumulative fuel consumption and energy use from this project, when added to fuel consumption and energy use from other projects and uses in the project area or the rest of the county would be insignificant. No significant adverse impacts to natural resources from uranium recovery have been identified so no cumulative adverse impacts would occur from this project.

Noise

Prior to the construction of the proposed La Jara Mesa Project (the project), local traffic, outdoor recreational activities, and sounds associated with wildlife and cattle grazing are the principal contributors to the existing noise levels in the project area. The following roadways contribute to the overall existing noise levels at the project site: periodic forest access road traffic on nearby trails as well as moderate traffic on State Route (SR) 605 located approximately 4 miles west of the project area and SR 547 located approximately 4 miles to the southeast.

Residential lands (the Cantina Acres Subdivision), hospitals, schools, parks, and churches are some of the most noise sensitive land uses in the area, although none of these exist close to the site. The closest sensitive receptors to the project site are the cities of Grants and Milan, NM, in Cibola County and the Cibola National Forest. Grants is located approximately 10 miles southwest of the project site. The project area is located within the Cibola National Forest which encompasses over 1.9 million acres and contains numerous campgrounds and other recreational activities. Residences surrounding Pumice Spring, Coal Mine Campground, and Lobo Canyon Campground are located within the Cibola National Forest, and are approximately 3 miles southeast of the project site.

Noise Standards and Guidelines

Noise resulting from industrial activities can impact the health and welfare of both workers and the general public. Workers are covered by Federal regulations regarding noise sources, noise control, and noise protection. No county or state noise regulations were found that apply to this site. The level of impact is related to the magnitude of noise, which is referred to as sound pressure level (SPL) and measured in units called decibels (dB). Decibels are calculated as a logarithmic function of the measured SPL in air to a reference effective pressure, which is considered the hearing threshold, or:

$$\text{SPL} = 20 \log_{10} (\text{Pe}/\text{Po})$$

where: Pe = measured effective pressure of sound wave in micropascals (μPa), and

Po = reference effective pressure of 20 μPa .

To account for the effect of how the human ear perceives sound pressure, the SPL is adjusted for frequency. This is referred to as A-weighting (dBA), which adjusts measurements for the approximated response of the human ear to low frequency SPLs (i.e., below 1,000 hertz (Hz)) and high frequency SPLs (i.e., above 10,000 Hz).

Noise has two different types of effects on people: the direct physical effects such as hearing loss and the less direct effects of interference with activities such as sleep and conversation. In the early 1970s, the EPA established numerical noise standards, summarized in the 1974 EPA report, “Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare With An Adequate Margin of Safety.” The noise standards were developed regardless of cost or technical feasibility. In developing these standards, the EPA drew upon a large body of survey data describing the degree of activity interference and resulting annoyance for a variety of noise levels. However, these standards were not meant to be pragmatic or realistic for short-term noise control standards (Harris 1991).

There is no Federal, State, or local noise standard applicable to the project. The Occupational Safety and Health Administration (OSHA) has operational health and safety guidelines for worker protection, including ear protection for certain activities, but these are not evaluated here. The company is required to meet OSHA health and safety standards that are designed to keep workers safe.

The EPA has developed guidelines for noise levels to protect the public health and welfare with an adequate margin of safety (EPA 1974). The U.S. Department of Housing and Urban Development (HUD) has promulgated noise criteria and standards “to protect citizens against excessive noise in their communities and places of residence.” The EPA recommends an outdoor nighttime weighted sound level (Ldn) (a 24-hour average SPL specifically calculated from daytime and nighttime time periods) of 55 dBA for residential and farming areas. The Ldn includes a greater weight for nighttime noise. For industrial areas, a sound level equivalent (Leq) of 70 dBA is recommended. The HUD recommended goal for exterior noise levels is not to exceed an Ldn of 55 dBA. However, the HUD standard for exterior noise is 65 dBA measured as Ldn.

Affected Environment

Noise levels in the project area are variable, depending mostly on road and aircraft traffic, outdoor activities, and seasonal noise source. While site specific baseline noise data has not been collected in the project area, it is presumed that baseline noise levels would be typical of rural areas and would be approximately 40 dBA. The remote nature of the area limited the likelihood that the public would be exposed to noise emissions from the project.

Environmental Consequences

No Action Alternative

Under the no action alternative, the project would not proceed and no change to the noise environment would occur. Some truck and traffic noise from SR 605 could still be heard on the site and less noticeable noise from other uses would continue.

Proposed Action

Construction and Operation

Construction and operation activities under the proposed action would have similar noise sources and levels along the road access and at the mine site. A description of those potential impacts is provided below.

Heavy Equipment Noise Sources

The EPA Office of Noise Abatement and Control has extensively studied noise levels from individual pieces of equipment as well as from construction sites of power plants and other types of facilities (EPA 1971). These studies remain the industry standard for estimating noise emissions from construction/demolition equipment where site-specific data is unavailable and were used in this noise impact analysis. The noise levels presented in these studies are expected to be conservative as newer equipment design has trended toward being quieter than the construction equipment of the 1970s.

Construction and mining activities would result in acceptable noise impacts at sensitive receptors that may be located within 1,500 feet (0.28 mile) of the project area. Table 32 shows the noise levels that are produced by typical heavy equipment at various distances.

Table 32. Typical noise levels from common construction equipment at various distances

Construction Equipment	Sound Pressure Level at 50 Feet (dBA)	Sound Pressure Level at 500 Feet (dBA)	Sound Pressure Level at 1,500 Feet (dBA)	Sound Pressure Level at 2,640 Feet (dBA)	Sound Pressure Level at 5,280 Feet (dBA)
Dozer (250 - 700 hp)	88	68	58	54	48
Front-end loader (6 - 15 cu. yards)	88	68	58	54	48
Trucks (200 - 400 hp)	86	66	56	52	46
Grader (13 - 16 ft. blade)	85	65	55	51	45
Shovels (2 - 5 cu. yards)	84	64	54	50	44
Portable generators (50 - 200 kW)	84	64	54	50	44
Cranes (11 - 20 tons)	83	63	53	49	43

Source: EPA 1971; Barnes et al. 1976

Equipment noise levels would fluctuate throughout the workday and would vary depending on the type of equipment used. The closest sensitive noise receptors are the residences described above that are approximately 3 miles from the project site, or more than 15,000 feet away. Noise attenuation applied to the equipment listed in table 32 shows that noise levels at 5,280 feet in distance fall below recommended EPA thresholds of 55 dBA. It is likely that, at 15,000 feet, the noise from all sources would fall close to background levels. In general, doubling the distance from a noise source reduces the decibel level by 6 decibels. Thus, the dozer, with a noise level of 48 dBA at a distance of 1 mile away would likely have a noise level of 42 dBA 2 miles away. Multiple sources acting simultaneously can increase emission levels slightly (by 3 dBA for two identical sources for example) but the even greater distance to the nearest residence (3 miles) would still approach near background conditions. Therefore, there would be no significant noise impacts to these sensitive receptors from construction or operation equipment.

Table 33. Calculated sound pressure level from vehicle traffic at various distances

Construction Equipment	Sound Pressure Level at 50 feet (dBA)	Sound Pressure Level at 500 feet (dBA)	Sound Pressure Level at 1,500 feet (dBA)	Sound Pressure Level at 2,640 feet (dBA)	Sound Pressure Level at 5,280 feet (dBA)
Reference Level ^a (L_O) _E , dBA	64	64	64	64	64
Traffic Flow Adjustment ^b Δ traffic, dBA	-28.6	-28.6	-28.6	-28.6	-28.6
Distance Adjustment ^c Δ distance, dBA	0	-10	-15	-17	-20
Average Sound Level ^d (L_{eq}), dBA	36	26	21	18	15

^a The velocity of all traffic is 56 km/h (35 mph) and calculated using the following formulas:

$(L_O)_E = 38.1 \log(v) - 2.4$ dBA where: v = average vehicle speed in km/h

^b Is calculated using the following formula: $(\Delta\text{traffic})_i = 10 \log (N_i d_o / v_i) - 32.2$ dBA where: $N_i d_o$ = hourly flow rate of vehicles of type i , vehicles per hour at reference distance of 15.2 m (50 feet)
 v_i = speed of the i th vehicle type, mph

^c Is calculated using the following formula: $(\Delta\text{distance}) = 10 \log (d_o/d)$ where: d = is the perpendicular distance from the receiver to the center of the travel lane

^d Average Sound level for each vehicle type (L_{eq}) is computed using the following formula:

Onsite Vehicle Traffic Noise Sources

During development work, parking would be provided for the 20 to 25 vehicles expected to transport workers to the project site. As the project transitions from development to mining operations in phase 2, parking spaces would be provided for 75 to 80 vehicles. A speed limit of 35 miles per hour (mph) would be implemented on the project site access road. This traffic data was used to calculate the noise impacts that mine worker transportation would have on receptors located within 2,640 feet (0.5 mile) of the project site access road. There is no data available for hourly traffic flow rate, therefore, an estimate of 80 vehicles per hour was assumed. The reference mean noise level $(L_O)_E$ from all vehicular traffic was then calculated using the following formula (Harris 1991):

$$\text{Automobiles: } (L_O)_E = 38.1 \log(v) - 2.4 \text{ dBA}$$

where: v is the average operating speed in mph.

An adjustment $(\Delta\text{traffic})_i$ was made to the reference mean noise levels calculated above to account for the total hourly flow of that vehicle type averaged over a 1-hour period (Harris 1991):

$$(\Delta\text{traffic})_i = 10 \log (N_i d_o / v_i) - 32.2 \text{ dBA}$$

where: $N_i d_o$ = hourly flow rate of vehicles of type i , vehicles/hour at reference distance of 50 feet; and v_i = speed of the i^{th} vehicle type, mph

An additional adjustment $(\Delta\text{distance})$ was made to the reference mean noise level calculated above to account for distances greater than the reference distance (d_o) of 50 feet (Harris 1991):

$$(\Delta\text{distance}) = 10 \log (d_o/d)$$

where: d = is the perpendicular distance from the receiver to the center of the travel lane

The average Leq is computed by adding the reference noise level from vehicles to an adjustment factor determined by vehicle speed and adding another adjustment factor for distance.

Blasting Noise Sources

Blasting noise would occur during construction and operation although construction blasting in phase 1 would be more likely to be heard locally. Blasting during construction of the adits would result in an intermittent and temporary increase in noise emissions until the mine access tunnel was deep enough into the mesa that sound was attenuated by surrounding rock. A typical sound level for blasting, measured at 50 feet from the source, is 94 dBA (Hoover 1996). Based on standard practices that noise levels are reduced by 6 dBA for every doubling of distance, blasting noise would be approximately 88 dBA at 100 feet, 82 dBA at 200 feet, and 76 dBA at 400 feet. Under any scenarios, blasting noise should not create significant impacts at SR 605 or at the nearest residences 3 miles away.

Because the area is used for grazing, initial blasting should be done during the months where cattle are not present or are not close to the mine opening. If this is not possible, herd owners should be notified of the blasting plans and cattle should be kept approximately 1,600 feet away from the source. This would result in a maximum blasting noise of approximately 70 dBA to the cattle. It is likely that cattle would show no effect at these levels and may show no effects at closer distances.

The closest sensitive receptors (Cantina Acres Homes), including the residences near Pumice Spring, Coal Mine Campground, and Lobo Canyon Campground, are located at a distance of approximately 3 miles from the project's boundary. The average sound pressure level generated by the constant operations of the facility would not be audible at the project's boundary. The predicted sound pressure level at a distance of 1 mile from the project due to construction and operation activities was calculated and is presented in table 34.

Table 34. Predicted sound pressure levels at 1 mile from the project

Sources	Sound Level (dBA)
Dozer (250 - 700 hp)	48
Front-end loader (6 - 15 cu. yards)	48
Trucks (200 - 400 hp)	46
Grader (13 - 16 ft. blade)	45
Shovels (2 - 5 cu. yards)	44
Portable generators (50 - 200 kW)	44
Cranes (11 - 20 tons)	43
Blasting	54
Traffic	15
Total	54

As shown in table 34, the predicted noise impact at 1 mile from the project site is 54 dBA. This predicted level is below the HUD recommended goal for exterior noise levels of 55 dBA. The closest sensitive receptors are located approximately 3 miles away from the project. Homes have

an average effective sound attenuation of 15 dBA between outdoors and indoors (EPA 1974). With the predicted outdoor sound level at 1 mile from the project site of 54 dBA, the predicted indoor sound level from the project at that distance would be 37 dBA. However, because residences and other close sensitive receptors are located more than 3 miles away from the project site, indoor noise impacts at that distance would be well below any applicable indoor sound pressure limits. Blasting noise would not have a significant effect on receptors 3 miles away.

It is impossible to predict actual sound levels and overpressure effects from the mine on local residents because it depends on the size of explosive charges used, the number and depth of holes (rock absorbs much of the blast energy), and whether delayed charges are used to reduce blast effects of the charges. This information is not known at this time. Likewise, it is impossible to define the exact duration of the blasting except that, unlike open pit mining, the blast effects and noise will get smaller and smaller as the blasting moves into the mine tunnel. This would occur within a few days of the initial blasts. No blasting is currently anticipated for installation of the escape raise.

Although actual noise levels cannot be predicted, an example of potential impacts can be provided based on analysis in an EIS prepared for a California quarry operation (Rudenko 2008). This analysis is relevant to the La Jara Mesa Project because it provides some context regarding the effects of distance in attenuating blast effects from mining. For example, the State of California (Caltrans) developed significance thresholds for the effects of blasting on people (CalTrans 2004). The Liberty Quarry example modeling predicted that, when using charge weights between 125.5 and 629 pounds, residents between 2,600 and 4,500 feet away were predicted to experience ground vibrations and overpressure between 10 percent and 22 percent of the significance criteria set by the state. Put another way, the report estimated that levels would be at 4.22 percent of the criteria at 10,000 feet away, 2.7 percent of the overpressure criteria at 15,000 feet (3 miles) away, and 1.45 percent of the vibration criteria at that distance. This was a surface mine with much longer term impacts than the La Jara Mesa Mine. Although this analysis has not been done for the project for the reasons described above, it does indicate that blasting is not likely to have a significant effect on residents 3 miles away. Whatever the effect, it would be further reduced when blasting enters the mine and emissions are further minimized.

Based on predicted sound levels at sensitive receptor points, and on a qualitative comparison to blasting at another mine, no significant noise impacts to residents would occur from construction and/or operation of the project.

Wildlife and cattle would be disturbed if present during initial blasting to start the adit opening. This disturbance can be reduced or eliminated if initial blasting is conducted when grazing cattle are not present, or are not close to the opening, and if sensitive wildlife periods (mating or nesting) are avoided. If present, cattle should be discouraged from grazing in the vicinity of the adit.

Cumulative Effects

Cumulative effects from noise emissions are limited by distance because of the attenuation of noise over distance as described in this section. The project site is remotely located in a national forest with minimal human uses and no other developments planned in the area of the mine. Based on the analysis above, noise impacts are minor and barely perceptible 3 miles away at the location of the nearest residence. No other projects are planned within 3 miles of the project;

therefore, wildlife would have ample room to move away from the project site if bothered by construction and operational noise. No other known construction or development activity is close enough to create cumulative noise effects to receptors. No cumulative noise impacts are expected.

Land Use and Recreation

The project is located approximately 10 miles northeast of the city of Grants in Cibola County, New Mexico (figure 1, “Site location”). The surface portal facilities would be located on claims controlled by the applicant at the base of La Jara Mesa at an elevation of 7,300 feet in the NE1/4, Section 15, T12N, R9W if the plan of operations is approved by the Forest Service. The mineralized zones that would be accessed from the portal are located in portions of Sections 1, 2, 11, 12, 13, and 14, T12N, R9W. The escape raise would be located on Forest Service administered lands on top of La Jara Mesa in Section 11, T12N, R9W.

Existing Land Use

Existing land use within the applicant controlled claim area includes undeveloped land covered primarily by shrubland, grassland/herbaceous upland, evergreen forest, and a small area used for quarries, strip mines, and gravel pits (NLCD 2000).

Existing land use along the proposed power line route includes shrubland, grassland/herbaceous upland, evergreen forest, and a small area used for quarries, strip mines, and gravel pits within 0.5 mile of the route (NLCD 2000).

Affected Environment

Forest Plan Management Areas

The project site is located on land administered by the Forest Service, which is under the jurisdiction of the Mt. Taylor Ranger District within the Cibola National Forest. The land use analysis for this project is focused on the mine site and the raise opening on the mesa. Access to the site is across private property lying west of the mine site. Land within the Cibola National Forest is managed under the 1985 “Cibola National Forest Land and Resource Management Plan” (forest plan) (USFS 1985). Completion of the updated plan is expected to be initiated once the grasslands plan revision effort is completed and is anticipated to begin in the spring of 2012. The forest plan defines the long-term direction for managing the Cibola National Forest and the Kiowa, Rita Blanca, McClellan Creek, and Black Kettle National Grasslands. The purpose of the forest plan is to provide for multiple use and sustained yield of goods and services from the forest in a way that maximizes long-term net public benefits in an environmentally sound manner. The 1985 forest plan identifies management areas and describes the management direction, prescriptions, and associated resource management standards and guidelines for each management area. The proposed project is located in Management Areas 13 and 14:

- **Management Area 13** - The 215,552-acre management area occurs on the Mountainair (7,845 acres), Mt. Taylor (60,465 acres), and Magdalena (147,242 acres) Ranger Districts and focuses on wildlife habitat. Seventy-seven percent of the area has slopes in excess of 40 percent, and this steep topography effectively isolates the areas with more gentle slopes. Vegetation types are varied with 69,339 acres (32 percent) in grassland and shrubs, 113,316 acres (53 percent) in pinyon-juniper, 27,297 acres (13 percent) in

coniferous and deciduous forest, and 111 acres of riparian. The area has three developed recreation sites. There is no rangeland classed as full capacity.

- **Management Area 14** – This 236,185-acre management area is located on the Mt. Taylor Ranger District. Slopes are less than 40 percent. Vegetation types are: (1) grama grassland/shrub, 67,929 acres (29 percent); (2) pinyon-juniper, 125,839 acres (53 percent); (3) coniferous forest, 41,033 acres (17 percent); and (4) 1,384 acres of riparian area. There are two developed recreation sites, 231,176 acres of full capacity rangeland, and 5,009 acres of potential capacity range in the management area. Nearly 47,479 acres of the full capacity range are in satisfactory condition.

Relevant forest plan guidelines and standards applicable to all management areas include the following:

- Process lease applications for geothermal and uranium (p. 72).
- All mining claims will be contested when the lands involved are designed for Federal programs (such as land exchanges and wilderness withdrawals) or when mining claims are used for nonmining purposes (p. 72).
- Mining operations shall be conducted so as to minimize adverse environmental impacts. Operations will be controlled by means of Forest Service approval of plans of operations and by periodic inspections of the operation (p. 72).
- Provide for joint use in corridors and combine uses to the extent possible in light of technical and environmental constraints (p. 74).
- Maintain mineral withdrawal on the Bernalillo watershed. Permit mineral leasing but exclude surface occupancy (p. 74).
- Wild and Scenic Rivers (FSH 1909.12, 8.2): New mining claims and mineral leases are prohibited within ¼ mile of the river. Valid claims would not be abrogated. Subject to regulations (36 CFR 228) that the Secretaries of Agriculture and the Interior may prescribe to protect the rivers included in the National Forest System, other existing mining activity would be allowed to continue. Existing mineral activity must be conducted in a manner that minimizes surface disturbance, sedimentation, and visual impairment. Reasonable access will be permitted (p. 80-1).
- Wild and Scenic Rivers, Scenic Rivers, and Recreational Rivers (FSH 1909.12, 8.2): New transmission lines, gas lines, water lines, etc., are discouraged. Where no reasonable alternative exists, additional or new facilities should be restricted to existing rights-of-way. Where new rights-of-way are indicated, the scenic recreational and fish and wildlife values must be evaluated in the selection of the site (p. 80-2 and 80-3).

There are no additional guidelines and standards applicable to mineral lands in Management Areas 13 and 14.

Recreation

The Forest Service provides recreational opportunities within the Cibola National Forest such as hiking, camping, and hunting. National forest recreation sites in the vicinity of La Jara Mesa include Coal Mine Campground, Lobo Canyon Campground, and the ranger district office. These sites are accessed via Lobo Canyon Road (State Route 547). Coal Mine Campground is located at an elevation of 7,400 feet, has 15 units, is open from May to September, and has a stay limit of 14

days. Lobo Canyon Campground is located at an elevation of 7,400 feet, has 6 units, is open from May to September, and has a stay limit of 14 days. The ranger district office is open all year. There is also another site, La Mosca Lookout, which is accessed via National Forest Route 453 (USFS 2006).

Overnight camping with recreational vehicles is a popular activity, and many of these forest visitors bring off-highway vehicles to explore the forest beyond their base camp. Major forest roads are usually maintained on an annual basis, providing initial access for dispersed recreationists to get from towns and highways to remote locations. These main roads connect with a large system of low standard roads. Most of these national forest roads were built for administrative activities such as timber harvesting and do not receive regular maintenance. Recent travel management decisions have added motorized trails and prohibited cross-country travel on the Mt. Taylor Ranger District. Late summer and fall are popular hunting seasons where many off-highway vehicles are used across the forest. A number of outfitter guides operate on the forest, and a large number of out of town visitors come to this forest to hunt elk, deer, antelope, bear, turkey, quail, and also to fish. Motor vehicles typically play a large role in the hunts, not only for camping but also to access game.

Environmental Consequences

No Action Alternative

Land Use

Under the no action alternative, current Forest Serviced management plans would continue to guide management of the project area, including grazing and other public uses. In addition, there would be no disturbance to existing land cover from the proposed La Jara Mesa Project and all associated infrastructure, including the surface facilities, water supply and pipeline, and access road improvements. Other uses of adjacent private lands would continue.

Recreation

The no action alternative assumes that the project site would remain undeveloped land, as currently managed by the Forest Service and adjacent private property owners. Recreational opportunities and current use of the roads would still occur on the project site.

Proposed Action Alternative

Construction

Land Use

Over the life of the project, 16.4 acres would be disturbed by the construction and operational activities associated with mine facilities, in addition to road access improvements, primarily using existing roads. This disturbance would be located on unpatented mining claims located on Federal lands administered by the Forest Service. Reclamation would decrease the amount of disturbance after construction is complete.

Recreation

Recreational activities are accessed via Lobo Canyon Road (SR 547) and would not be affected by construction of the proposed project because the recreational activities occur 3 miles away. Potential visual impacts of the proposed action alternative are discussed in the “Visual

Resources” section that follows. Increased traffic on access roads during commute hours would conflict with recreational uses of those roads during those times. Because of low frequency of recreational use, this impact would be minor.

Operation

Land Use

Disturbance of the 16.4 acres of land would occur for approximately 20 years, after which the project site will undergo reclamation activities to remove structures and grade and restore the land. Land use at the site would be restricted to mining access for the life of the project. The proposed project’s consistency with the standards and regulations for mineral resources identified in the 1985 forest plan is discussed below for each applicable standard and regulation.

- Process lease applications for geothermal and uranium (p. 72).

Forest Service is processing the lease application for the proposed project (uranium mine) as part of the EIS process.

- All mining claims will be contested when the lands involved are designed for Federal programs (such as land exchanges and wilderness withdrawals) or when mining claims are used for nonmining purposes (p. 72).

The Forest Service does not need to contest the mining claim because no lands within the disturbed area have been designated for Federal programs. The proposed project is a uranium mine; therefore, the mining claim is being used for a mining purpose.

- Mining operations shall be conducted so as to minimize adverse environmental impacts. Operations will be controlled by means of Forest Service approval of plans of operations and by periodic inspections of the operation (p. 72).

The project has been designed to minimize adverse environmental impacts through minimal surface disturbance and the use of offsite facilities to process the uranium ore. Detailed underground development work would be conducted to better define the uranium deposit, thus eliminating impacts on La Jara Mesa that would otherwise result from extensive surface drilling and its associated network of closely spaced drill hole pads and interconnecting roads.

Underground development would avoid the large-scale disturbance associated with surface or open-pit mining. No onsite mill or associated tailings facilities are planned for the project. The underground mining operations would produce unmineralized (nonradioactive) waste rock, and uranium mineralized material to be collected for removal and offsite testing during phase I.

- Provide for joint use in corridors and combine uses to extent possible in light of technical and environmental constraints (p. 74).

Improvements to the local road system, including turn lanes, would be constructed where the site access road intersects with NM 605, to accommodate the anticipated 12 to 13 daily truckloads of ore hauled from the site. In addition, the proposed transmission line would follow the existing transmission line that lies south of the proposed access road and the access road to the mine site.

- Maintain mineral withdrawal on the Bernalillo watershed. Permit mineral leasing but exclude surface occupancy (p. 74).

The project site is located within the Rio San Jose watershed (Hydrologic Unit Code 13020207), not the Bernalillo watershed.

- Wild and Scenic Rivers (FSH 1909.12, 8.2): New mining claims and mineral leases are prohibited within ¼ mile of the river. Valid claims would not be abrogated. Subject to regulations (36 CFR 228) that the Secretaries of Agriculture and the Interior may prescribe to protect the rivers included in the National Forest System, other existing mining activity would be allowed to continue. Existing mineral activity must be conducted in a manner that minimizes surface disturbance, sedimentation, and visual impairment. Reasonable access will be permitted (p. 80-1).

The nearest wild and scenic river is the East Fork Jemez Wild and Scenic River which is located over 70 miles from the project site. This applies the requirements below as well.

- Wild and Scenic Rivers, Scenic Rivers, and Recreational Rivers (FSH 1909.12, 8.2): New transmission lines, gas lines, water lines, etc., are discouraged. Where no reasonable alternative exists, additional or new facilities should be restricted to existing rights-of-way. Where new rights-of-way are indicated, the scenic recreational, and fish and wildlife values must be evaluated in the selection of the site (p. 80-2 and 80-3).
- Scenic Rivers and Recreational Rivers (FSH 1909.12, 8.2): Subject to regulations (36 CFR 228) that the Secretaries of Agriculture and the Interior may prescribe to protect the rivers included in the National Forest System, new mining claims could be allowed and existing operations allowed to continue. However, mineral activity must be conducted in a manner that minimizes surface disturbance, sedimentation, and visual impairment (p. 80-2).

Recreation

Recreational activities are accessed via Lobo Canyon Road (SR 547) and access would not be restricted by operation of the proposed project because it is 3 miles away. Hunting would be prohibited on the site itself and would be affected by operation to the extent that any game animals would avoid the site or access road. This would be a minor impact because cattle grazing already conflicts with hunting activity in the area. Potential visual impacts of the proposed action alternative are discussed in the “Visual Resources” section that follows.

Cumulative Effects

No other projects are proposed in the immediate vicinity of the project. Another mine is proposed near Mt. Taylor to the north. The nearest residences and campgrounds are approximately 3 miles away. Therefore, no cumulative impacts to recreation would occur from future activities as a result of the construction and operation of the proposed project, other than the cattle grazing activities already discussed. The site itself would be restricted from any recreational use but none has been documented. The project would contribute to recreational use restrictions on Mt. Taylor as a whole that would be created by other proposed mining activities on Mt. Taylor.

Visual Resources

Affected Environment

Visual quality objectives (VQOs) are standards by which the visual resources of an area are managed on National Forest System lands. VQOs are derived from physical and sociological characteristics of an area and describe the degree of acceptable modification in the basic elements (line, form, color, and texture) of the landscape. The visual analysis of this project includes the mine site and raise opening.

When evaluating the visual resource impacts of a project, the visual quality objectives are considered because that defines the visual sensitivity and value of the resource. Also relevant to the visual impacts of a project are the characteristics of the project itself and the number of viewers likely to encounter the resource. Although these two factors do not influence the VQO of a site, they do determine the potential need for modifications and improvements to a project, should there be significant modifications to characteristics of the VQO.

Visual quality objective boundaries on the Cibola National Forest were delineated in 1981 and adopted by the forest plan in 1985 (USFS 1985). The boundaries were revised in 1991 to reflect management decisions outlined in the 1985 forest plan. Classes of VQOs (listed from most restrictive to least restrictive) include: preservation, retention, partial retention, modification, maximum modification, and rehabilitation. These are defined as follows:

- *Preservation:* This visual quality objective allows ecological changes only. Management activities, except for very low visual impact recreation facilities, are prohibited.
- *Retention:* This visual quality objective provides for management activities which are not visually evident. Under retention, activities may only repeat form, line, color, and texture which are frequently found in the characteristic landscape. Changes in their qualities of size, amount, intensity, direction, pattern, etc., should not be evident.
- *Partial Retention:* Management activities are visually evident but subordinate to the characteristic landscape when managed according to the partial retention visual quality objective. Activities may repeat form, line, color, or texture common to the characteristic landscape but changes in their qualities of size, amount, intensity, direction, pattern, etc., remain visually subordinate to the characteristic landscape.
- *Modification:* Under the modification visual quality objective, management activities may visually dominate the original characteristic landscape. However, activities of vegetative and landform alteration must borrow from naturally established form, line, color, or texture so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area or character type.
- *Maximum Modification:* Management activities of vegetative and landform alterations may dominate the characteristic landscape. However, when viewed as background, the visual characteristics must be those of natural occurrences within the surrounding area or character type. When viewed as foreground or middle ground, they may not appear to completely borrow from naturally established form, line, color, or texture. Alterations may also be out of scale or contain detail which is incongruent with natural occurrences as seen in foreground or middle ground.
- *Rehabilitation:* This classification includes previously disturbed sites that are in a period of recovery to a higher level of visual quality but the level has not been established and is in transition.

The proposed escape raise on top of La Jara Mesa would be located within the maximum modification VQO. Under the maximum modification VQO, management activities may dominate the characteristic landscape but should appear as a natural occurrence when viewed as a background. The proposed 0.1 acre escape raise facility site is located amid trees (figure 25). Forest Road 544 is located approximately 165 feet from the site. A 200-foot buffer surrounding the escape raise location was evaluated because of the potential for the facility to dominate the foreground of the visual landscape within this distance. Beyond that distance, trees would likely block views of the site.

The proposed portal surface facilities, power line, and road improvements would be located within the modification VQO. Under the modification VQO, management activities may visually dominate the original characteristic landscape. However, activities must borrow from naturally established form, line, color, or texture so completely and at such a scale that their visual characteristics are those of natural occurrences within the surrounding area or characteristic type. Additional parts of these activities such as structures and roads must remain visually subordinate to the proposed composition.



Figure 25. Proposed escape raise site and proximity to Forest Road 544

A 3-mile buffer surrounding the portal surface facility was evaluated because of the potential for the facility to be viewed from that distance, albeit as a subordinate element of the landscape. Figure 26 depicts the portal facility site from a distance of approximately 2.5 miles.

Road improvements and the power line may also be seen by some observers within that buffer. A portion of the proposed underground mine development would be located below the surface area along the rim of La Jara Mesa that is classified as partial retention VQO. Under the partial retention VQO, management activities may be evident but must be subordinate to the characteristic landscape. The underground development would not be seen in the area classified as partial retention VQO.

Neither the portal surface facilities nor the escape raise would be visible from NM 605 which is located a distance of approximately 6.5 miles to the southwest.



Figure 26. Photo of portal facility site at a distance of 2.5 miles from access road to be improved

Environmental Consequences

No Action Alternative

Under the no action alternative, there would be no new effects to visual quality of the area. Existing features such as the access road at NM 605, the electrical transmission line, and existing private and Forest Service roads would continue to be visible to persons using the site. These features would be visible for a distance of approximately 1 mile from NM 605 and diminishing in contrast beyond that distance.

Proposed Action

The landscape of the surface facilities would be altered by development of the mine, power lines, and road improvements. These activities would begin with roadway and other improvements in phase 1 and continue with permanent water supply and transmission line construction in phase 2. Because the visual resource analysis is based on the environment and the facilities and improvements put in place, rather than operation, the impact analysis does not differentiate between the phases.

The altered landscape at the portal facility would be visible to observers within a radius of less than approximately 3 miles of the portal facility, with the exception of those whose view is obstructed by the topography or vegetation. The most obvious visual impact will be the road improvements from NM 605 back toward the mine site, using an existing roadway. There is no view of the site from the north, or the east because of La Jara Mesa. Various observers using the property in the mine vicinity could include hunters, other recreationists, ranchers managing livestock, and users of roads within that radius including tribal members approaching Mt. Taylor for traditional cultural practices. The new power line and road improvements could be observed over a wider area by those observers. Over the life of the project, 16.4 acres would be disturbed by the construction and operational activities associated with mine facilities, in addition to road access improvements. Reclamation would decrease the amount of disturbance after mining is complete.

The 0.1 acre escape raise would be located within the maximum modification VQO. The sole facility at the surface site of the escape raise, described in chapter 2, would be a 10- by 20-foot “generator shed,” which would house a diesel generator for emergency electric power for the escape hoist (figure 5, “Raise layout”). The facilities would be surrounded by an 8-foot-high fence. The escape raise facilities would be subordinate in the existing landscapes to the trees. In order to minimize any visual impacts, this small structure would be constructed of wood and would be painted with a Forest Service approved color to blend with the surrounding forest landscape.

The surface portal facilities, power line, and road improvements would be located within the modification VQO. The facilities would be seen from the partial retention VQO by viewers looking over the rim of La Jara Mesa. The surface portal facilities would be seen by observers from some perspectives within approximately a 3-mile radius. In order to minimize visual impacts, all buildings would be painted to match local natural tones at the site. The structures and roads would remain visually subordinate to the characteristic landscape and proposed composition.

Operation

Visual quality would change as a result of mining activity and equipment, vegetation removal, topographic changes, road improvements, power lines, dust, and reclamation. As seeded vegetation becomes established on reclaimed surfaces, visual impacts would become less obvious in the landscape. The heaviest recreational uses of the Cibola National Forest occur during the hunting season, when back-country users and hunters would encounter landscape and visual impacts due to increased mining activities. These visual impacts would range from minor to moderate depending upon the sensitivity of the viewer, and would change seasonally for the life of the project and reclamation period. Viewer sensitivity of hunters and ranchers is expected to be low; while that of tribal members or hikers is expected to be high. Due to the isolated nature of

the site, the modification and maximum modification VQO objectives of the site, the limited number of potential viewers, and low profile of the facility, overall visual resource impacts from the mine is low.

Cumulative Effects

The area of potential cumulative effect from this project incorporates a viewshed within 3 miles of the proposed facilities. The site is barely perceptible beyond a 3-mile distance. Past visual impacts in that area include prospect pits near the access road, an area that has been trenched and mechanically excavated along the access road, and an open pit located approximately 500 feet to the west of the portal facility. An electric transmission line can also be observed to the east of the access road. There are two track roads crossing the escape raise site. Forest Road 544 and exploratory drill pipes are located a few hundred feet from the escape raise site. Other past visual impacts are evident from past timber harvesting such as old haul roads and cut stumps.

There are no other proposed projects in the vicinity of the mining project that would contribute to visual impacts that are not already addressed in this section. Therefore, the cumulative visual resource impacts of this project are not significant.

Population and Housing

Affected Environment

This section describes existing population and housing in the project vicinity and potential impacts from the project on population and potential demands for new housing. The data presented in this section also relate to the environmental justice analysis provided in this EIS.

The project site is located approximately 10 miles northeast of the communities of Grants and Milan, in Cibola County. The next nearest community is the city of Gallup, located to the northwest in McKinley County, approximately 60 miles from Grants and 70 miles from the site. If there were to be changes in population and/or housing from the proposed project, they would be most likely to occur in the nearest towns of Grants and Milan. Albuquerque is the farthest of the four towns discussed, approximately 65 miles from Grants and 75 miles from the site. It has by far the largest population, facilities, and employment base. Because of their size and proximity, the population data from Grants and Gallup are discussed.

Table 35 shows the population changes from 2000 to 2008 for the communities of Grants and Gallup, the two counties they reside in, and the State of New Mexico. The total population in the State of New Mexico and Cibola County increased from 2000 to 2008, while the total population in McKinley County decreased during that same period.

According to data provided on the Grants Chamber of Commerce Web site (Grants, New Mexico, 2009) the population in Grants in 2009 was approximately 9,000 people and the population of Milan approximately 2,500. The official Web site for Gallup indicates that this city is home to approximately 20,000 people (Gallup, New Mexico, 2009).

Table 35. Population changes for Grants and Gallup, Cibola and McKinley Counties, and the State of New Mexico, 2000 to 2008

Area	Total Population: 2000 Census ¹	Total Population: July 1, 2008 ²
New Mexico	1,819,046	1,984,356
Cibola County, New Mexico	25,595	27,285
McKinley County, New Mexico	74,798	70,724
Gallup, New Mexico	20,209	na
Grants, New Mexico	8,806	na

Sources: ¹ U.S. Census Bureau, 2001b; ² U.S. Census Bureau, 2008

Housing characteristics in 2000 are presented in table 36. Grants and Gallup, the nearest communities to the project site, together had almost 1,000 vacant housing units in 2000.

Current employment in Grants and Gallup and the two counties in which they are located was acquired from the Bureau of Labor Statistics (2009). Unemployment in Grants (Metropolitan Statistical Area) was 5.6 percent in March 2009; reflecting the same percent unemployment as Cibola County. June estimates for Grants and Cibola County are at 6.5 percent while the State as a whole ended the year with an estimated unemployment of 8.3 percent. Unemployment in Gallup (Metropolitan Statistical Area) was 6.5 percent, similar to McKinley County which reported rates as high as 7.7 percent.

Table 36. Housing characteristics for Grants and Gallup, Cibola and McKinley Counties, and the State of New Mexico in 2000

	Grants, New Mexico	Gallup, New Mexico	McKinley County, New Mexico	Cibola County, New Mexico	New Mexico
Total housing units	3,626	7,349	26,718	10,328	780,579
Occupied housing units	3,202	6,810	21,476	8,327	677,971
<i>Owner-occupied housing units</i>	2,145	4,104	15,544	6,414	474,445
<i>Renter-occupied housing units</i>	1,057	2,706	5,932	1,913	203,526
Vacant housing units	424	539	5,242	2,001	102,608

Source: U.S. Census Bureau, 2001b

With an estimated population of approximately 27,000 people in Cibola County in 2009, and approximately 40 percent below the age of 18 or above the age of 65, the 6.5 percent unemployment rate yields an estimated number of unemployed of approximately 1,050 people. There are “underemployed” residents in the county as well, but that number is not known (workers who have settled for a temporary job until they get the better one they prefer are “underemployed”). Both the unemployed and underemployed are local candidates for mining jobs from the project.

Mining employment in Cibola County was reported to be 102 jobs in 2002 and 106 jobs in 2004 or about 1 percent of total employment. The mining sector was once the most important industry employer in Cibola County. In 1981, uranium mining accounted for 41 percent of all jobs in Cibola County (McDonald 1982).

Environmental Consequences

No Action Alternative

Under the no action alternative, the project site would retain its current land use and zoning designation and remain undisturbed as a mine claim on Forest Service managed property. It may or may not be developed with some compatible use some time in the future. The project site would remain in its current condition. The Forest Service would not issue a permit to mine, and no impacts would occur to population and housing within the vicinity.

Proposed Action Alternative

Construction and Operation

The workforce requirements for the underground development activities at the project site could reach approximately 60 employees during phase 1, with 25 of these staffing the day shift.

At full mine production, workforce requirements are projected to be approximately 110 employees, working in two shifts. So the total number of job seekers will be approximately 25 initially with a demand for approximately 85 more workers 2 years later if mining proceeds.

With more than 1,000 people unemployed in Grants, Milan and Gallup alone, plus a significant pool of workers both employed and unemployed in Albuquerque, and including additional residents who are underemployed in Grants County, there is a sufficient supply of workers available in the immediate area to staff most of the project during project development and during the phase 2 operational phase. Mining is not a new industry in the project area, and has been the main source of employment in the area for the last 50 years (NRC, GEIS, 2008). Mining employment has diminished over the last 20 years because the price point for uranium has fluctuated. However, with knowledge of mining in the area contributing to the potential for local hires, and the local unemployment combined with the modest new job needs, no significant immigration is likely to occur as a result of the project.

If, for some reason, most of the workers were hired from outside the region, which seems unlikely, the following scenario would occur. The initial 25 employees represent a very minor worker addition and would be assimilated into the regional population before the mine began operation. If 85 additional employees were hired for the mine, there would be no impact to population and housing unless there was insufficient housing available. As of this writing, there are approximately 1,000 housing unit vacancies in Grants and Gallup alone, not considering Albuquerque. This is far more than any needs of project employment, so there will be no significant impacts on housing from this project.

Cumulative Effects

The analysis of potential cumulative effects on population and housing from this project, when added to reasonable foreseeable future impacts, included the Cibola County area in particular with consideration for any population impacts to Gallup. The analysis considered other project

development and potential population growth not already accounted for in the affected environment discussion. The only additional project identified in the area which might contribute to new population is another mining project – the Roca Honda Mine proposal. It is located approximately 20 miles northeast of the proposed La Jara Mesa Mine and is currently going through the environmental analysis process. The Roca Honda Mine is larger than the La Jara Mesa Mine Project and would have more employees. It is still going through environmental review. The operational date of the mine is not certain. If the Roca Honda Mine began operation in the same year as the proposed action, and local hires were not available to support employment, there would be additional demand on housing from those newly hired workers who don't already live in the area. However, even double or triple the number of workers could be housed with existing vacancies discussed here, and not including capacity in Albuquerque.

In conclusion, the proposed project would not have significant effects on population or housing and in combination with the only identified additional project likely to generate new jobs, would not contribute to any significant cumulative impacts on population and housing.

Environmental Justice

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment, as defined by Executive Order 12898 discussed below, means that no low income or minority population group should bear a disproportionate share of the negative environmental consequences, such as environmental and human health risk and economic impacts resulting from industrial, governmental, and commercial operations or policies. Meaningful involvement means that: (1) people have an opportunity to participate in decisions about activities that may affect their environment and/or health; (2) the public's contribution can influence the regulatory agency's decision; (3) the public's concerns will be considered in the decisionmaking process; and (4) the decision makers seek out and facilitate the involvement of those potentially affected.

On February 11, 1994, President Bill Clinton signed Executive Order (EO) 12898; Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (59 Fed. Reg. 7629 (1994)). This EO was intended to focus Federal attention on the environmental and human health conditions of minority and low income populations with the goal of achieving environmental protection for all communities. The executive order directed Federal agencies to evaluate whether any Federal action creates environmental and human health risks and impacts that disproportionately affected low income and/or minority populations. The order was intended to encourage Federal agencies to avoid such disproportionate impacts, although there is no requirement to do so, and to develop strategies to help Federal agencies address disproportionately high and adverse human health or environmental effects of their programs on minority and low income populations, where such effects exist.

This executive order does not provide direction regarding the mitigation of project impacts not otherwise addressed in a NEPA document, nor does this order mandate any requirement. It does not provide requirements or prohibitions from impacts to such populations any more than those impacts that might occur to human populations as a whole. The executive order provides direction to determine whether the impacts to any and all human populations from a proposed action already identified are disproportionate to low income and/or minority populations, or not. If there are impacts and they are not disproportionate to low income and/or minority populations,

there is no conflict with environmental justice goals. This analysis is focused on whether the impacts identified in this EIS are disproportionate to low income and/or minority populations.

CEQ Guidance

The Council on Environmental Quality (CEQ) prepared a guidance document (CEQ 1997) for implementing Executive Order 12898 as part of the NEPA process. The CEQ guidance defines minority and low income populations. The term “minority population” includes people who identify themselves as American Indian or Alaskan Native, Asian or Pacific Islander, Black or African American (not of Hispanic origin), or Hispanic. According to the CEQ guidance, minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent, or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. In other words, the intent of the EO is to recognize and consider significant populations (>50 percent minority or a “meaningfully greater” minority population) and not merely the presence of a minority group.

CEQ guidance states that low income populations in an affected area should be identified with the annual statistical poverty thresholds from the Bureau of the Census’ Current Population Reports, Series P-60 on Income and Poverty. In identifying low income populations, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect.

The analysis includes residents, permanent or temporary such as in the case of migrant workers, who are affected by a proposal. It is focused on residents who have little choice about the siting of a facility near them. It does not include potential employees of a project who may or may not live in the area, who drive to and work at a facility by choice and who are exposed in that manner, and who are covered by other State and Federal employment, health and safety, and similar regulations designed for their welfare.

Affected Environment

The proposed project is located in Census Tract 9745 which covers approximately 2,600 square miles (approximately 60 percent of Cibola County). Census tract sizes are influenced by population density and the low density in this area resulted in a large census tract. The project site is within land managed by the Forest Service and the closest communities are Milan and Grants, approximately 10 miles to the southwest. The town of Milan includes part of Census Tracts 9744 and 9745. The city of Grants includes parts of Census Tracts 9744, 9742.01, and 9742.02.

Table 37 presents the racial composition and income characteristics for those census tracts, the proposed project census tract, for Cibola County and the State of New Mexico. The percentage of American Indian and Alaska Natives in the four census tracts ranges from 8 to 12 percent, which is comparable to the State percentage of 10 percent and significantly less than Cibola County as a whole which has 40 percent of its population identified as American Indian and Alaska Natives. Therefore, the affected census tracts have a lower Native American population percentage than the greater area. All four census tracts have a very high Hispanic or Latino population (around 50 percent), which is greater than that of the State of New Mexico and Cibola County, and qualifies the Hispanic population as an identified, if not protected, minority class in the census tract.

Table 37. Racial composition and poverty statistics for Census Tracts 9745, 9744, 9742.01 and 9742.02, Cibola County, and the State of New Mexico

	Census Tract 9745 (Project in County)	Census Tract 9744 (Milan)	Census Tract 9742.01 (Grants)	Census Tract 9742.02 (Grants)	Cibola County (Whole County)	New Mexico (State)
Race and ethnicity¹						
White alone	3,439	1,859	2,556	1,772	10,138	1,214,253
Black or African American alone	57	35	96	46	246	34,343
American Indian and Alaska Native alone	439	367	576	379	10,319	173,483
Asian alone	12	0	47	33	98	19,255
Native Hawaiian and Other Pacific Islander alone	3	1	2	8	14	1,503
Some other race alone	1,109	861	1,137	773	3,952	309,882
Two or more races	195	165	245	98	828	66,327
Total population	5,254	3,288	4,659	3,109	25,595	1,819,046
Hispanic or Latino	2,498	1,740	2,474	1,536	8,555	765,386
Minority population	34.5%	43.5%	45.1%	43.0%	60.4%	33.2%
Hispanic or Latino population	47.5%	52.9%	53.1%	49.4%	33.4%	42.1%
Income below poverty² level						
Total population with income in 1999 below poverty level	882	804	1,178	423	6,054	328,933
Percent of population below poverty level	16.8%	24.5%	25.3%	13.6%	23.7%	18.1%

Sources:

¹ U.S. Census Bureau, 2001a;² U.S. Census Bureau, 2001b

Approximately 25 percent of the populations of Census Tracts 9744 and 9742.01 covering Milan and Grants have incomes below the poverty level. This is comparable to Cibola County as a whole. Census Tracts 9745 (Milan) and 9742.02 (Grants) have 14 to 17 percent of their population below the poverty level which is comparable to 18 percent for the State. Thus, the income level in the vicinity of the mine is at the State average and above the level of some adjacent census tracts.

Environmental Consequences

No Action Alternative

Under the no action alternative, the project site would retain its current land use and zoning designation and remain undisturbed as a mine claim on Forest Service managed property. It may or may not be developed with some compatible use some time in the future. The Forest Service would not issue a permit to mine and no impacts would occur to any populations, including minority or low income populations, disproportionately or otherwise, in the general vicinity.

Proposed Action Alternative

Construction

The environmental impacts from construction of the proposed action that have been discussed in this EIS would not disproportionately impact minority or low income populations because there are no communities within 10 miles of the site and because the population of the census tract containing the project (34.5 percent minority) does not have a disproportionately lower income (16.8 percent below the poverty level) or greater minority status than other populations in the county or State as a whole.

Operation

Similar to construction above, any potential impacts at the project site would not disproportionately impact minority or low income populations. No disproportionate environmental or human health risk has been identified from this project. No disproportionate economic risk or effect has been identified from this project. There are no disproportionate minority populations within 10 miles of the project site. This project would be located in a remote location in the national forest. The closest community is Grants, 10 miles away. No adverse impacts to population or housing have been identified in Grants; therefore, there would be no disproportionate impacts to minority and low income populations in that area during operation of the project.

Tribal members who feel that the project would affect them because it is located at a site (Mt. Taylor) that is eligible for designation under Federal rules as a traditional cultural property (TCP) may be affected as described in the “Heritage Resources” section. Other impacts to tribal members have been discussed in the “Cultural Resources” section of this EIS. Such effects are not economic or health based, but they may affect tribal members who feel the project affects Mt. Taylor as a living, breathing entity or that the activity at the mine site affects their use of the mountain. Because these potential effects are comprised of beliefs of those who may or may not live in the designated census tracts, or who may or may not visit, or be affected by the mine site itself, these are not discussed under environmental justice and are discussed in the “Heritage Resources” section that follows.

Cumulative Effects

The cumulative effects considered under environmental justice criteria include the potential for disproportionate effects to low income and minority populations over the last 10 years within the census tracts encompassing the mine site and city of Grants. The project would not contribute to cumulative impacts on minority or low income populations because the low income and minority populations in this area are not disproportionate to other populations in the county or State as a

whole. The cumulative effects on Mt. Taylor itself as an eligible TCP include any projects proposed since the determination of eligibility, and includes all of the designated portions of Mt. Taylor. To the extent that this project impacts an eligible TCP based on the beliefs of Native Americans, this and other proposed mine projects on Mt. Taylor would potentially conflict with those beliefs. This and other projects having an impact on the eligible TCP would have an indirect effect on those whose beliefs and practices rely on Mt. Taylor as a TCP. Such affects would disproportionately affect tribal members holding those beliefs and using the mountain for such purposes. Additional mine proposals and their impacts are reasonably foreseeable but not disproportionate, for the reasons discussed above, except for tribal members who believe that the project conflicts with their beliefs related to Mt. Taylor.

Public Services and Utilities

This section discusses the project's potential impact to local government services and public and private utilities serving the project area. The potential for such impacts can arise during project construction or operation if temporary construction or permanent workers and their families move into new areas such as Grants and require new or expanded services. This potential also exists if the project itself affects existing services and utilities beyond their normal capacity to respond.

New and increased populations can put additional strains on public services and utilities if significant numbers of them are created by a project. As discussed in the "Population and Housing" section, there is a substantial labor force available in the Grants-Gallup and Albuquerque area and no significant in-migration is expected during construction or operation. Operational demands on services and utilities resulting from the project itself are discussed in this section.

Affected Environment

All public services and utilities provided in Grants are located approximately 10 miles from the project site. One utility service, electric power, would be provided onsite.

Community Services

Police Services

The New Mexico State Police Department, District 6, the Cibola County Sheriff's office located in Grants, and the Grants Police Department provide police protection for Grants and the unincorporated areas of the county. Milan also has its own police department. State police services are located just east of Grants on Highway 66.

Fire Services

Fire protection for Grants and the immediate area is provided by the First District Fire Department located in Grants. Nine professional firefighters staff the department, with three on shift at all times. Additional fire protection is provided by a second station as well as volunteer stations in Milan, Bluewater, and Double Canyon. These are diverse teams of career and temporary agency employees who are multiskilled professional firefighters. The Forest Service also provides fire protection through their firefighting program. They provide two engines and firefighters located in Grants.

In addition, some fire protection would be provided at the project mine site by employees designated as first responders, including emergency medical technicians (EMTs). In some cases, these responders may not be certified as firefighters but would have received some training.

Emergency Medical Services

Hospital and ambulance service is available in Grants, approximately 10 miles from the site, in the event of a medical emergency. The Cibola General Hospital is a 25-bed general medical and surgical care hospital located in Grants. Key services include intensive care and an emergency department.

Schools and Colleges

The Grants-Cibola County School District is located in Grants. Schools in the district include seven elementary schools and the Los Alamos Middle School, the Laguna-Acoma Jr. – Sr. High School, and Grants High School. The New Mexico State University also has a branch campus in Grants.

Utilities

Communications

In Grants, telecommunications and wireless service is provided by Comcast. Verizon provides only wireless technology to the Grants area. The primary telephone service provider is Qwest, with CenturyTel and Navajo Communications providing a small fraction of the service.

Water Supply and Potable Water

No utilities provide water to the site or the surrounding area. There is no water service at the project mine site itself. The applicant would drill a water well and establish a pump station on the Elkins Ranch property (adjacent to the access road) to provide water to the project site. Water is available from the San Rafael Water District in Grants as well. The final depth of the new well may be determined by the delivery capacity of various aquifers at the well site.

Wastewater

The site is not served by municipal wastewater collection systems or a septic tank. The applicant would dispose of sanitary sewage waste through a septic tank and leach field system designed to meet Cibola County permit requirements. No industrial wastewater will be discharged.

Electricity

Continental Divide Electric Cooperative (CDEC), a non-profit, consumer-owned electric distribution co-op, provides electrical service to Grants and the general vicinity of the project site (CDEC 2009). CDEC does not own or control any electric generation resources; rather it purchases electric energy from Tri-State Generation and Transmission Association. The co-op owns about 3,850 miles of primary distribution lines throughout Cibola County and parts of McKinley, Sandoval, Bernalillo, and Valencia Counties, including the transmission lines near the project site.

Natural Gas

There is no natural gas at the site. New Mexico Gas Company provides natural gas service to the Grants area, including Gallup, as well as the greater Albuquerque metro area.

Environmental Consequences

No Action Alternative

Under the no action alternative, the project site would result in no impact to public services or utilities. No other ongoing or future activities are anticipated to impact public services or utilities in the project area.

Proposed Action

Construction

Due to the remote location of the site within National Forest System lands, there are no public services or utilities located at the project site, except for the existing transmission line adjacent to the access road. There would be no impacts to public services and utilities at the project site during construction, other than a tie-in to the existing transmission line in phase 2. There would be no adverse impacts to public services from construction during phase 1 or phase 2.

Operation

There would be no adverse impacts to public services or utilities at the project site with the exception of electrical power and a connection to the existing power line near the site in the vicinity of the proposed well. Power supply is adequate for the intended demand and no adverse impacts are anticipated. There would be no significant impacts to public services offsite because no significant increase in population is expected in Milan, Grants, or elsewhere from mine employment.

Cumulative Effects

The area of potential effects on community services and utilities is in and adjacent to the city of Grants and the town of Milan. There are no services at the site other than electric transmission. Past effects on these services and utilities are reflected in the existing conditions discussion. There are no known future demands in either municipality that would impact public services and utilities. The project would not contribute to cumulative impacts on local government services or public and private utilities serving the area because no adverse impacts are anticipated to occur to these services from the project.

Economics

This section discusses the potential economic impacts of uranium mining to the area and to the State of New Mexico; impacts to the State are discussed under cumulative impacts. A quantitative economic evaluation of revenues, expenditures, taxes, and income and costs of public services and utilities from this project to Grants, Milan, Cibola County, and other local towns was not warranted because there would be few, if any, impacts to public services and utilities and, therefore, no requirement to examine revenue sources to pay for them. Similarly, there were no significant local costs anticipated to local government as a result of increased demands for housing and associated infrastructure.

The “Population and Housing” section describes the jobs created by the La Jara Mesa Mine Project during construction and operation. The approximately 100 jobs created would occur in an area with existing high unemployment and an adequate labor force to supply most of the employment requirements. With little or no cost impacts to public services and utilities, the mine itself and the jobs it creates would provide positive economic benefits to the local economy from wages. Comments raised in scoping included concerns about the economic impacts of uranium mining to the State. This section, then, discusses a broader potential range of economic impact to Cibola County and to the State as a whole from the uranium mining industry, should it continue to grow.

The information presented in this section is based on, and extracted from, an economic evaluation of uranium mining in New Mexico. It was prepared by faculty members at New Mexico State University (NMSU): “The Economic Impact of Proposed Uranium Mining and Milling, Operations in the State of New Mexico,” James Peach and Anthony V. Popp (2008), Office of Policy Analysis, Arrowhead Center, Inc., New Mexico State University, Las Cruces, New Mexico, August 1, 2008 (NMSU 2008). The purpose of the study was to determine the potential economic effects of uranium mining in the State of New Mexico. To respond to the public concerns about economics, the Forest Service decided to incorporate the findings of this study on that topic. This section uses the information and conclusions presented in the NMSU study cited above and discusses it in context with the project. The project would be located within Cibola County; therefore, the relevant facts about employment and demographics within Cibola County are presented within the affected environment section below. In addition, general information about wages and taxes anticipated from the La Jara Mesa Project are also included.

The NMSU study presented the analysis for a base case scenario of assumed statewide uranium production, assuming that uranium markets return. The base case scenario assumes that approximately 315 million pounds of uranium would be produced in New Mexico during a 30-year period, or approximately 10 million pounds per year. For context, if the La Jara Mesa Mine operated at maximum production; delivering 500 tons of uranium ore per day, 7 days a week, the mine would produce a total of 182,000 tons of ore per year, or 365 million pounds of ore (not uranium). At the highest expected uranium concentration (0.3 percent) and if milled to 100 percent uranium, this amount of ore would yield 1.095 million pounds of uranium per year or about 10 percent of the uranium that was assumed to be mined in the report.

Affected Environment

New Mexico was the leading producer of uranium in the U.S. during the 1950s, 1960s, and 1970s. State production declined dramatically after the late 1970s and, except for small recovery operations, most production ended by the early 1990s, and ceased altogether after 2002. Mining regulations and uranium processing have both changed dramatically during this period.

During the 1990s and early 2000s, uranium prices fell below the cost of production. In 2000, the spot market price of a pound of uranium was as low as \$6, but by mid-2007 this price had increased to \$143. A more meaningful uranium price is the long-term or contract price which in early 2008 was approximately \$90 per pound. At higher prices, uranium mining and milling in New Mexico are both feasible.

Recent trends in world and national energy markets enhance the prospects for increased uranium demands for nuclear fueled power plants and for significant uranium industry activity in New

Mexico, although the current state of the economy in 2011 is affecting the overall demand for energy. Three energy market developments are particularly important to the potential for increased demand for uranium. First, dramatic increases in the demand for energy in the developing world, particularly China and India, have changed the nature of world energy and natural resources markets. There is general agreement among energy analysts that the increases in world energy demand will continue for the next few decades. Second, world-wide concern about climate change and the environmental consequences of increasing carbon fuels combustion to meet increasing energy demand suggest an increase in demand for nuclear (or other renewable) generated electricity. The Obama administration, for example, announced loan guarantees for new nuclear plants in Georgia in February 2010, committing to a supportive nuclear strategy. Third, depleted stockpiles of fuel for nuclear plants in the U.S. contribute to the renewed interest in uranium mining and milling operations. Uranium reserves in New Mexico are estimated by the U.S. Department of Energy to be approximately 341 million pounds of uranium at a production cost of \$50 per pound. Estimated reserves at higher market prices would be substantially greater as more expensive reserves become cost effective to mine. State uranium reserves are potentially a very significant economic resource, according to the study.

Cibola County, New Mexico

New Mexico's uranium ore is located mainly in Cibola and McKinley Counties. The project site is located in Cibola County, thus results of the statewide economic study are particularly relevant to Cibola County.

Cibola County: Economic Characteristics

Per capita income in Cibola County has been approximately 60 percent of the national average since 1982. Per capita personal income in Cibola County in 2005 was \$18,935. Cibola County ranked twenty-ninth among counties in New Mexico in terms of per capita income. Cibola County's 2005 per capita income was 67.9 percent of the corresponding State figure (\$27,889), and 54.9 percent of the national average (\$34,471). The growth rate of per capita income in Cibola County in the 2000 to 2005 time period (26.8 percent) has been slightly higher than that of New Mexico (26 percent) and has been substantially higher than the Nation's per capita income growth rate (15.5 percent).

Household and family incomes in Cibola County are low compared to national and State figures as reported in the 2000 Census. Median household income in Cibola County was 66.1 percent of the national average and median family income was 61.4 percent of the national figure. The poverty rate in Cibola County (21.5 percent of families) is high compared to the Nation (9.2 percent of families).

Cibola County: Labor Force Characteristics

Compared to the Nation or the State, Cibola County has low labor force participation rates (53 percent) and a high unemployment rate (11.5 percent as reported in the 2000 Census and 6.5 percent using more recent 2009 estimates). The unemployment rate for Cibola County has been consistently higher than the State unemployment rate although the gap has been narrowing. Between January 1998 and December 2002, Cibola County's average monthly unemployment rate was 7.23 percent, more than 2 percentage points higher than the State average unemployment

rate (5.45 percent). From January 2003 to December 2007, Cibola County's unemployment rate averaged 5.48 percent, only slightly higher than the State average of 4.99 percent.

Mining employment in Cibola County was reported to be 102 jobs in 2002 and 106 jobs in 2004 or about 1 percent of total employment. The mining sector was once the most important industry in Cibola County. In 1981 uranium mining accounted for 41 percent of all jobs in Cibola County (Peach and Popp 2008; McDonald 1982, p. 17 as cited in Peach and Popp 2008).

Environmental Consequences

No Action Alternative

Under the no action alternative, the project would not be constructed and there would be no economic impact due to the project. Cibola County would not have the benefit of an additional 110 long-term jobs, nor the increases in associated tax revenue from property, sales, and income taxes.

Proposed Action Alternative

Construction

The temporary underground development and construction phase of the project would be about 2 years and require approximately 60 employees until the second phase started.

Operation

It is reasonable to expect that many of those entering the labor force would stay in the area if good paying jobs are available. The proposed project would provide a small number of good paying jobs. Therefore, it is expected that a plentiful labor force would be available for the construction and operation of the project. This would add revenue to the county and surrounding communities through sales and income taxes for the life of the mine. For example, assuming an average salary for 110 operational workers at the site of approximately \$50,000, the annual payroll would be \$5,500,000. If State income tax was collected at the standard 5-6 percent rate, \$275,000 to \$330,000 in annual State income taxes would be generated. The applicant would add a 5 percent gross receipts tax on an annual sale of uranium ore and other costs which would yield additional revenues.

New Mexico imposes a severance tax, a conservation tax, and a resource excise tax on uranium production. In addition, renewed uranium operations would generate State tax revenue through direct, indirect, and induced economic activity. These taxes include personal income tax, corporate income tax, and gross receipts tax. No attempt was made to calculate direct and indirect labor multipliers because there is no indication that service costs would be increased to the extent that mitigation would be needed. However, it is reasonable to assume that ongoing mining would generate more than \$300,000 in annual State income taxes, \$500,000 in conservation and excise taxes, and an unknown amount of gross receipts tax for a net annual tax contribution of well over \$1 million.

Cumulative Effects

The "Economics" section in this EIS is a cumulative analysis of the potential economic effects of uranium mining in New Mexico, as determined by the Forest Service when determining the scope

of this EIS. This analysis discusses the economic history of mining and forecasts the reasonably foreseeable economic effects of uranium development from this project when added to other potential projects, if mining proceeds. This will be determined by the costs of supply and demand. The base case impact scenario was derived from industry provided data. The base case reflects anticipated projections from companies planning uranium operations in Cibola and McKinley Counties. All uranium mining in the State of New Mexico occurs in Cibola and McKinley Counties because the State's uranium deposits are located there. The base case may understate future uranium operations in New Mexico to the extent that not all potential projects have been included in this report. Trends and projections of world and national energy markets provide strong evidence that the base case scenario is a genuine possibility. Recent volatility in the spot price of uranium does not substantially change the long-term supply and demand outlook.

Direct employment for the base case during the construction phase for all mines was estimated from aggregated industry input data after eliminating extreme high and low observations. The estimate used for mine construction was four workers (jobs) for each million dollars of capital expenditures. Direct employment for the base case construction phase for mills was estimated from the input data as 2.5 workers per million dollars of expenditures from the industry input data (assuming that processing mills were permitted and operating in the state). This employment-to-expenditure ratio, as with the comparable figure for all mines, is lower than most impact models provide.

The base case assumes the following:

- Total production from 2012 to 2042 of 315 million pounds of uranium statewide.
- An average cost of production of \$50 (2008 dollars) per pound.
- 234 mine workers per million pounds of production.
- 77 mill workers per million pounds of production.

A summary of base case mining and milling impacts would be as follows:

- Output would be approximately \$25.978 billion dollars.
- Employment would be approximately 248,681 jobs.
- Labor income would be approximately \$14.197 billion dollars.

The cumulative impacts of uranium mining and milling operations in the base case are assumed to take place beginning in 2012 and ending by 2042. This time horizon does not mean that each mine and mill is expected to operate continuously for 30 years. Some mines may produce for only 9 or 10 years. The selected time horizon reflects the fact that the investment in mines and mills is a long-term business decision. Based on industry provided data, total production was estimated to be 315 million pounds of U308.

This estimate reflects currently known plans. Additional operations and production currently in the pre-planning stage are not considered. This figure (315 million pounds of U308 production) is less than the 341 million pounds of reserves in the State as estimated by the Energy Information Administration (EIA) in 2003 at a forward cost of \$50 per pound. It is highly likely that the 5-year-old EIA reserve estimates understate the total uranium reserves in New Mexico.

Cumulative economic impacts to the State would include millions of dollars in revenue and would substantially reduce unemployment. This is considered to be a positive potential cumulative impact of the project. This would not occur if uranium prices were not sufficient to support the costs of mining and milling.

The analysis did not estimate costs to the State due to road wear from trucking since this particular cost is addressed by commercial truck license fees in New Mexico, in addition to the tax structures summarized above.

Heritage Resources

Cultural resources are nonrenewable resources. Federal regulations obligate Federal agencies to manage cultural resource properties and prohibit the destruction of significant cultural sites without first mitigating the “adverse effect” to the site. Mitigation measures may include, but are not limited to, complete detailed site documentation, complete avoidance of the site, and/or data recovery efforts. The National Historic Preservation Act (NHPA) of 1966 (as amended) and the Archaeological Resources Protection Act (ARPA) of 1979 are the primary laws that address the preservation of cultural resources.

Section 106 of the NHPA (1966), as amended, requires Federal agencies to evaluate any action that may adversely affect any structure or object that is in, or can be included in, the National Register of Historic Properties (NRHP). These regulations, codified at 36 CFR 800, provide a basis for how to determine if a site is eligible. Beyond that, the regulations define how those properties or sites are to be dealt with by Federal agencies or other involved parties. These regulations must be considered for historic properties, sites of historic importance, or archaeological sites. The Southwestern Region of the Forest Service executed a programmatic agreement with four State Historic Preservation Officers (SHPOs) and the Advisory Council on Historic Preservation that outlines how the national forests in the Southwestern Region will administer their activities subject to Section 106 of the National Historic Preservation Act. The forests follow the programmatic agreement to meet their Section 106 responsibilities.

Cultural resources provide data regarding past technologies, settlement patterns, subsistence strategies, and many other aspects of history. The guidelines for evaluation of significance and procedures for nominating cultural resources to the NRHP can be found in 36 CFR 60.4. In order to be eligible for nomination to the NRHP, a cultural resource site/historic property must retain integrity and meet at least one of the four National Register criteria:

1. Association with events that have made a significant contribution to the broad patterns of our history.
2. Association with the lives of persons significant to our past.
3. Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.
4. Have yielded, or may be likely to yield, information important in prehistory or history.

A traditional cultural property (TCP), as defined in the NHPA, is a property that is eligible for inclusion on the NRHP “because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community’s history, and (b) are important in maintaining

the continuing cultural identity of the community” (Parker and King 1994). Stated another way, a significant TCP is defined as a property with “significance derived from the role the property plays in a community’s historically rooted beliefs, customs, and practices” (Parker and King 1994).

A TCP is typically a location—frequently a land formation or landscape—recognized for its association with the cultural practices or beliefs of a living community that are rooted in history and are important to maintaining cultural identity. Traditional practitioners may conduct cultural and religious activities at the Mt. Taylor TCP as discussed below. Over time, these have included, but are not limited to collection of plants, stones, minerals, pigments, soil, sand, and feathers, catching eagles, hunting game and birds, pilgrimages to place offerings, and visits to shrines and springs (Benedict and Hudson 2008). The term “heritage resources,” used by the Forest Service, encompasses not only cultural resources but also traditional and historic use areas by all groups (Native Americans, Euro-Americans, etc.). Objects, buildings, places, and their uses become recognized as “heritage” through conscious decisions and unspoken values of particular people, for reasons that are strongly shaped by social contexts and processes. Heritage resources define the characteristics of a social group (i.e., community, families, ethnic group, disciplines, or professional groups). Places and objects are transformed into “heritage” through values that give them significance.

The “Heritage Resources” section is separated into “TCPs” and “Archaeological Resources” subheadings. The subheadings reflect the regulatory and geographic extent differences between the two topics of interest. The “TCPs” subheading discusses the TCP designation and listing eligibility and factors that relate to the site, to Mt. Taylor as a whole, and to the formal consultation conducted by the Forest Service for this project. The “Archaeological Resources” subheading discusses physical artifacts as they appear on the surface in the immediate area of the project that might be exposed or covered during construction and operation. Impacts and mitigation are discussed separately for both topics.

Affected Environment

Traditional Cultural Property

The Cibola National Forest conducted government-to-government consultation with interested tribes about possible TCPs that could be affected by the proposed project. One known TCP is Mt. Taylor; the Forest Service (Cibola National Forest) in consultation with the SHPO, Advisory Council, and tribes, has designated Mt. Taylor as a TCP under Federal guidelines and determined in 2008 that the mountain is eligible for listing on the National Register of Historic Places (Benedict and Hudson 2008). The current project area is within the western boundary of the Mt. Taylor TCP. This TCP is included with other cultural resources identified within the project area in discussions below that include treatment recommendations. An assessment of the impacts of this project on the TCP is included at the end of this section.

American Indian Uses

Mt. Taylor meets the criteria of a TCP because its significance is derived from its role in the historically rooted beliefs, customs, and practices of the tribal communities. The tribes define Mt. Taylor as a landscape larger than the peak and its summit; it encompasses the adjacent mesas and plateaus, down to the valleys.

A TCP can be eligible for inclusion in the National Register “because of its association with cultural practices or beliefs of a living community that are (a) rooted in the community’s history and (b) are important in maintaining the continuing cultural identity of the community” (National Register Bulletin 38:1). Mt. Taylor is a place where tribes continue to perform ceremonial activities in accordance with traditional cultural practices that maintain their cultural identity and the continuity of their culture.

The Mt. Taylor TCP has been determined eligible for inclusion in the National Register of Historic Places because of its significant association with traditional cultural uses (criterion A), because of its association with spirit beings that figure prominently in the oral tradition of the tribes (criterion B), and because it is a property that has yielded important information through ethnographic and archaeological research (criterion D).

Mt. Taylor holds considerable cultural significance for area tribes, including the Navajo Nation, Hopi Tribe, western Pueblos of Acoma, Laguna, and Zuni, many of the Rio Grande Pueblos, and the Jicarilla Apache Nation. It has long standing and ongoing historical, cultural, religious importance for these tribes. All consider the mountain to be sacred, and some acknowledge and have identified specific sites of traditional cultural and religious significance within the larger boundaries of the mountain.

Traditional practitioners go to the mountain to conduct cultural and religious activities. These have included, but are not limited to: collection of plants, stones, minerals, pigments, soil, sand, and feathers, catching eagles, hunting game and birds, pilgrimages to place offerings, and to visit shrines and springs. Mt Taylor is also central to some activities that take place away from the mountain but are dependent on the mountain.

There are some common cultural elements about Mt. Taylor that have emerged from tribal consultation. These common elements about Mt. Taylor include the following:

- American Indians have continually used the mountain for cultural purposes. For some tribes, use may be sporadic, but is cyclic and is generally based upon a seasonal calendar of prescribed cultural activities.
- The mountain figures prominently in American Indian oral traditions regarding origin, place of emergence, and migration. It plays a vital role in ceremony, cosmology, and religion of the tribes.
- The mountain is viewed by the tribes as a living, breathing entity that embodies a spiritual essence.
- Tribes believe that spirit beings recounted in oral traditions inhabit the mountain.
- Tribes believe the continuity of some tribal cultural practices is dependent upon Mt. Taylor.

In addition to demonstrating that a property is significant under at least one of the National Register criteria, the property must also possess integrity; the ability to convey its significance. The National Register criteria recognize seven aspects, or qualities, that in various combinations, define integrity. These include: location, design, setting, materials, workmanship, feeling, and association. In the case of properties that possess traditional cultural significance, it is also important to consider the integrity of relationship and condition.

The Mt. Taylor TCP possesses integrity of location, setting, and association. These aspects of integrity address the character and presence of the physical features that convey the character of the property. The mountain, from whichever direction it is viewed, appears largely as it did in the past. Modern activities and alterations, such as development of roads, trails, communication sites, and developed recreation sites have had an impact, but have not irreparably altered the landform of the area. Mt. Taylor has retained the essential physical features that make up its character.

The Mt. Taylor TCP also possesses integrity of relationship and condition, even though some development has occurred on the mountain that has required the tribes to modify their traditional activities to ensure privacy and solitude.

“If a property is known or likely to be regarded by a traditional cultural group as important in the retention or transmittal of a belief, the property can be taken to have an integral relationship with the belief or practice, or vice versa” (National Register Bulletin 38:10).

The tribes that ascribe cultural significance to the mountain have stated that the TCP is essential to their traditional cultural practices and is critical to the continuity of their beliefs and traditional cultural practices. The tribes consulted still engage in traditional cultural and religious activities on Mt. Taylor. They regard the mountain with deep reverence and consider it a vital entity in their lives and the continuance of their cultural practices and beliefs.

Refer to “Mt. Taylor Traditional Cultural Property Determination of Eligibility for the National Register of Historic Places” (Benedict and Hudson 2008) for a more detailed discussion of the agency’s basis for defining Mt. Taylor a traditional cultural property eligible for the National Register.

Tribal Consultation

The Cibola National Forest routinely consults with eight tribes that have used and continue to use Mt. Taylor district lands for traditional cultural or religious activities. These include: the Pueblos of Acoma, Laguna, Zuni, Jemez, and Sandia, the Hopi Tribe, the Navajo Nation, and the Jicarilla Apache Nation. In addition, at the request of the Navajo Nation, the forest consults with 11 Navajo Chapters that are located in the vicinity of the land managed by the Mt. Taylor Ranger District. The Forest Service has conducted extensive consultation with the involved tribes. Documentation of the tribal consultation can be found in the project record.

The tribes and chapters were consulted regarding the proposed project. The project was first introduced to the tribes and chapters in the forest’s annual consultation letter, sent to the tribes in late August 2008. A written response was received from the Hopi Tribe. The initial project consultation meetings were held in the fall of 2008 with all the tribes, except the Jicarilla Apache Nation. The Pueblo of Isleta deferred comments and consultation on this undertaking to the Pueblos of Acoma, Laguna, and Zuni.

In the spring of 2009, all the tribes were contacted in writing regarding the possibility of doing a joint consultation with the New Mexico Environment Department and the New Mexico Mining and Minerals Division. The Pueblo of Acoma responded in writing. Some of the other tribes agreed verbally. The State agencies participated in subsequent consultation meetings with the Pueblo of Acoma, the Hopi Tribe, and the Jicarilla Apache Nation held in the spring and fall of 2009. Project consultation meetings were held with all eight tribes between early summer and late fall of 2009.

The Jicarilla Apache Nation indicated its desire to defer to the Navajo Nation and other neighboring pueblos to consult on the specifics of the undertaking. The tribe requests additional consultation only if it is determined that the undertaking will impact Apache sites. All the tribes concur that the planned La Jara Mesa uranium mine falls within the boundaries of what they consider to be Mt. Taylor. It is located at the western edge of the traditional cultural property as defined by the Forest Service in 2008 and as defined by the tribes who nominated the mountain for listing on the State Register of Cultural Properties in 2008.

All of the tribes stated their opposition to the development of the La Jara Mesa uranium mine. Their stated concerns about the development and operation of the La Jara Mesa uranium mine can be characterized as both cultural and environmental in nature. The cultural concerns will be addressed in tribal consultation. The environmental concerns will be addressed through the NEPA process. Following are the tribes' stated concerns about the development of the La Jara Mesa uranium mine and its effect upon the TCP.

American Indian Cultural Concerns

- The tribes consider La Jara Mesa to be part of Mt. Taylor. The tribes believe that effects of uranium development will impact the traditional cultural property as a whole; impacts to one part of the mountain result in an impact to the whole.
- The tribes view the mountain as a living, breathing entity that embodies a spiritual essence. Mining activity is considered desecration to the mountain, and will alter the spiritual integrity of the mountain in its entirety.
- The tribes consider mining a "taking" from the earth, a whole living entity. They believe it will leave Mt. Taylor incomplete and diminish its power.
- The tribes believe the act of mining or extraction itself is the issue, not the number of holes or tunnels, the nature or scope of the digging, or the type of material removed.
- All tribes consider Mt. Taylor to be a living being. Removal of uranium from under the mesa is viewed by some as the extraction of an organ from a living being.
- The tribes believe that mining causes harm to a living landscape. Significant landscapes like Mt. Taylor are important because they are considered the home of clan deities or spiritual beings, and may be visited in the afterlife.
- The tribes believe that spirit beings inhabit the mountain. Desecration to the mountain will impact the spirits; their ability to travel and reside on the mountain, and their ability or willingness to aid the people in healing ceremonies and by providing rain, snow, plants, wild game, and other resources essential for survival.
- The tribes believe that subsurface materials such as uranium are passive until disrupted. Mining causes disruption that may have unforeseen consequences (natural disasters). By continuing on a path of more uranium development, we may be unknowingly upsetting the process and balance, and put human society at risk.
- The tribes believe that altering or severing the connection with the sacred mountain threatens the survival of Indian people.
- The tribes are concerned that mining activities will displace and/or disrupt some traditional cultural practices on the mountain.

- The tribes believe that mining constitutes an adverse cumulative effect upon the mountain, and upon tribal use of the mountain in the future, for traditional cultural and religious purposes.
- The tribes are concerned that mining will alter cultural practices through disruption of continuity of cultural beliefs and traditional cycles.
- The tribes believe that significant changes to the location of traditional activities, or abandonment of certain areas due to mining impacts, will lessen the power of the medicine.

American Indian Environmental Concerns

- The tribes are concerned that contamination of water will render the area unuseable to traditional practitioners and threaten the domestic water supply of neighboring tribal communities.
- The tribes are concerned that depletion of the groundwater will dry up the springs that are important for traditional cultural uses.
- The tribes are concerned about potential contamination to plants, soil, and water (both surface and groundwater). The tribes are concerned that contamination may transfer to vegetation, rendering plants and evergreens unpure and unfit for personal and traditional use.
- The tribes are concerned that the disturbance caused by mining may stop religious leaders from using some of their areas to collect herbs for healing. If an area becomes unuseable due to impacts or contamination, the practitioners will need to find new locations to do their collection.
- The tribes are concerned about contamination of surface soil and water, and the possibility of airborne contamination as a result of wind.
- The tribes are concerned about contamination of surface water and groundwater—direct, indirect, and cumulative effects upon natural resources and neighboring communities.
- The tribes are concerned about airborne contamination from emissions of radon from the escape shaft on La Jara Mesa, the mouth of the tunnel, and from the dust created by the vehicles transporting the radioactive material. Dust is a concern as it may contaminate plants and drift with the prevailing winds toward tribal communities.
- The tribes are concerned over containment of radioactive material after it is removed from the mine, but before being transported to an offsite processing facility.
- The tribes are concerned regarding public safety during transport of radioactive material.
- The tribes are concerned that uranium development will have other impacts, beyond the boundaries of the national forest. The tribes are concerned that the city of Grants may not be equipped to handle the influx of people and this may put stresses on its ability to maintain a “zero discharge system” that may result in sewage spills and contamination of farm lands and reservoirs on adjacent tribal lands.
- The tribes are concerned that revenue generated by the mining activity will result in an influx of people to the area that will cause further pollution and a greater drain on the area’s natural resources.

- The tribes are concerned about bioaccumulation of particulate matter in plants. Concerns include primary, secondary, and tertiary impacts (contamination of food chain, snowmelt, and ground and surface water).
- The tribes are concerned about insufficient monitoring for water contamination and reclamation.
- The tribes are concerned about disposition of waste rock.
- The tribes are concerned about the past record or performance of the mining companies (legacy health issues, environmental damage, contamination of water, lack of proper reclamation).

Archaeological Resources

Culture History

The summary below briefly describes the range in age and variety of cultural site types located in and near the project area. Human occupation of the area began in the Paleoindian Period (11,000 to 6,000 B.C.). Originally believed to be dependent on now extinct megafauna such as bison, mammoth, and mastodon, recent research has shown that Paleoindian groups also utilized varied flora and fauna resources (Cordell 1997). The Archaic Period (6,000 to 400 B.C.) is characterized by continuation of the hunting and foraging economy of the preceding Paleoindian Period with technological adaptations to changing climatic conditions. A growing reliance on plant foods during the Archaic Period is also evidenced by grinding tools such as one-hand manos and basin metates. The first evidence of definable architecture in the form of semi-subterranean pit structures appears during the middle-to-late Archaic Period (1800 B.C.–A.D. 600). During the Basketmaker II and III Periods (400 B.C. to A.D. 720) hunters/gatherers engaged in horticulture, while later in the period stored excess foodstuffs beyond their seasonal needs. Instead of a mobile lifeway based on natural resource abundance, these people begin a longer seasonal habitation and possibly even permanent habitation in areas that are both productive for maize based agriculture and seasonal hunting (Stuart and Gauthier 1981).

The Pueblo I Period (A.D. 720 to 920) is characterized by linear and crescent-shaped surface storage and living structures in association with pit structures. During the Pueblo II Period (A.D. 920-1100) linear above ground masonry habitation structures (unit pueblos) were occupied by single, extended families while the pit structure form evolves into a different use: a kiva. The development of Chacoan communities begins, marked by the construction of planned, multistoried “Great Houses” and large “Great Kivas.” The Pueblo III Period (A.D. 1100 to 1275) was one of great change in the southwest. People aggregated into larger villages that housed multiple families within the same apartment-like structures. During the Pueblo IV Period (A.D. 1275-1540), aggregation of peoples continued to larger villages with up to 1,000 rooms. Towns are long lived and new agricultural strategies are developed to deal with this new level of sedentism. Another development during this time is the migration of Athapaskan (Dineh and Apache) peoples from the north. The arrival date of the Athapaskans into northwest New Mexico is debated by scholars (Kelley 1982).

In A.D. 1540, the Coronado Expedition to the Southwest marks the beginning of the historic period. This changed puebloan culture radically in economic, religious, social, and political terms. Endemic disease; raiding by Navajo, Ute, Apache, and Comanche peoples; and the Spanish system of land grants and mission establishment also took their toll and drastically reduced traditionally held areas and population. The first European presence in the Grants and Bluewater

areas was during the late sixteenth to mid-seventeenth centuries with Spanish exploratory and military expeditions. Mexico gained independence from Spain in 1821 and held claim to what is now New Mexico until 1846 when the U.S. Army, under S. W. Kearny, took possession of the territory during the U.S. and Mexico War.

The most recent listings of the NRHP have been consulted and no sites which appear on the register and no sites which have been nominated to the register occur in the project area. This proposal complies with the provisions of the NHPA of 1966 and with Executive Order 11593.

Project Area Survey and Results

A total of 125 acres was surveyed for this project. The surveys focused on the physical footprint of the facilities located at the portals and escape raise as well as access routes. These surveys documented eight previously recorded archaeological sites and six new sites. The 15th site located within the physical area of effect is the Mt. Taylor TCP. A total of 28 isolated occurrences (IOs) were identified during the Class III cultural resources survey of the project area. IOs include lithics, tin cans, and bottle glass, or bottles that are found with no apparent association with other cultural material or features. The field documentation of the IOs formally exhausted their information potential and, therefore, they require no further consideration. None of the IOs are deemed eligible for listing on the National Register or State Register of Cultural Properties.

Table 38. Archaeological sites determined to be within the project area

Site	Eligibility
New Sites	
AR-03-03-02-2880/LA 163193	Undetermined
AR-03-03-02-2881/LA 163194	Undetermined
LA 163195	Undetermined
LA 163196	Undetermined
LA 163197	Undetermined
LA 163198	Undetermined
Previously Recorded Sites	
AR-03-03-02-818/LA 48224	Undetermined
AR-03-03-02-819/LA 48225	Eligible (d)
AR-03-03-02-820/LA 48226	Not eligible
AR-03-03-02-821/LA 48227	Not eligible
AR-03-03-02-2317/LA 131426	Undetermined
AR-03-03-02-2768/LA 153870	Undetermined
AR-03-03-02-2770/LA 153873	Undetermined
AR-03-03-02-2771/LA 153872	Undetermined

A total of 14 archaeological sites were determined to be within the project area as a result of the survey and the records review conducted for this investigation (table 38). The inventory of archaeological sites within the project area has been consulted on with the SHPO and consensus determination has been reached on site eligibility. Eleven of the archaeological sites are currently regarded to have undetermined eligibility, and will be treated as eligible for this environmental analysis until a determination of eligibility is made. Seven of these sites will be impacted by the project, and testing will be done to determine their eligibility to the National Register of Historic Places. Two sites were previously determined not eligible for inclusion on the National Register. Ineligible sites do not constrain management activities and will not be carried forward in this analysis. One site has been previously determined as eligible for listing on the NRHP.

Environmental Consequences

An action has an effect on a historic property when the action may alter the characteristics of the property that may qualify it for inclusion in the National Register of Historic Places. Once it is determined that an action will have an effect, the regulations require that the Agency apply the criteria of adverse effect (36 CFR Part 800.5).

An adverse effect is found when an action may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the property's integrity. Adverse effects may include reasonably foreseeable effects caused by the action, be farther removed in distance, or be cumulative.

No Action Alternative

Traditional Cultural Property

This alternative does not increase or add any additional adverse effect on the TCP; however, it would not reduce existing disruption of traditional cultural and religious activities that occur within the Mt. Taylor Traditional Cultural Property. These existing disruptions occur due to ongoing land management practices and public use of the land.

Archaeological Resources

Under the no action alternative, the project would not be constructed and there would be no impacts to archaeological resources from the proposed project. This alternative does not increase or add any additional adverse effects on the archaeological resource sites located within the proposed project area; however, it would not reduce existing disturbances to heritage resources.

Proposed Action

Traditional Cultural Property

The proposed action is located within the Mt. Taylor Traditional Cultural Property. The characteristics that qualify Mt. Taylor for inclusion in the National Register are its integrity of location, setting, association, relationship, and condition.

The proposed action would have an adverse effect upon the Mt. Taylor Traditional Cultural Property because the undertaking would alter the characteristics of the property that qualify it for inclusion in the National Register of Historic Places in a manner that would diminish the

property's integrity of relationship. It is the relationship or association of the beliefs and traditional practices to the property that give the property its significance. Mt. Taylor has an integral relationship with beliefs and traditional cultural practices of the consulted tribes and is critical to the maintenance of their cultural identity and transmittal of their beliefs.

The proposed action would result in the disruption, alteration, and displacement of traditional cultural activities that are critical to the continuity of cultural beliefs and practices of these tribes. In the view of the tribes, impacts to the traditional practitioners' ability to conduct their traditional cultural activities in the area will lessen the overall effectiveness of their prayers, medicine, and healing ceremonies. Development on the mountain has not stopped all traditional and cultural activities, but it adversely impacts the traditional practices and diminishes their value.

The implementing regulations (36 CFR Part 800) list physical destruction of or damage to all or part of a property as one example of an adverse effect. Physical damage of the landform caused by construction of the mine would occur, but is considered secondary to the impact to the integrity of relationship. The degree of physical alteration is limited; the primary mining operation would impact approximately 16 acres, within a property that is 442,659 acres in size. The size of the impact would not significantly alter the landform which constitutes the TCP. For this reason, the size of the damage in relation to the scale of the property, physical damage is not a primary criterion for determining the effect of the undertaking on the Mt. Taylor TCP.

Another criterion for an adverse effect (36 CFR Part 800) is the introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features. Even though the mining activities would be confined to a localized area, the auditory effects would not be considered temporary. This noise would include blasting and operation of compressors and generators. Auditory effects can interfere with the meditative atmosphere and privacy necessary for some traditional cultural activities. The construction and operation of the mine would introduce auditory elements that have the potential to affect the property, in that it would affect the use of the property for traditional cultural and religious activities.

Based on a viewshed analysis done for this undertaking (Hudson 2010), there is a visual effect, but it is limited. The 16-acre footprint of the mine cannot be seen from the summits of Mt. Taylor or La Mosca Peak. The primary view of the mine is from the southwest, just north of the community of Milan as well as the eastern portion of the Zuni Mountains. The portion of La Jara Mesa where the mesa-top mine related development will be located is visible from La Mosca and Mt. Taylor (assuming no tree cover), however, due to its small size, and presence of trees on the mesa, the visual effect would be negligible.

Effects on Archaeological Resources

Effects on archaeological resources during mine construction and operations are essentially the same because the impacts to the sites would occur at the beginning of project implementation. Of the 12 archaeological sites within the project area that have been determined eligible to the National Register, or undetermined, 11 are located along access roads and 1 is located within the footprint of the mine facility. Seven sites would be disturbed by ground-disturbing activities associated with mine construction and operation. The remaining five sites are located outside the area to be cleared or filled by ground-disturbing activities and will be avoided.

Of the 11 archaeological sites located within or adjacent to road access corridors, 4 (LA 163198, AR-03-03-02-819/LA 48226, AR-03-03-02-2881/LA 163194, AR-03-03-02-818/LA 48224) will

be directly impacted by reconstruction of the Elkin's road and FR 450, and the construction of a buried waterline and aerial power line within the road corridor. Three of the sites (LA 163195, LA 163196, LA 163197), located on private land, are no longer within the area of potential effect because the road will be rerouted to avoid impacts to these sites.

Four sites are located along FR 544. One site (AR-03-03-02-2317/LA 131426) is adjacent to the road but would not be impacted by routine road maintenance. There is one site (AR-03-03-02-2768/LA 153870) adjacent to the road and within the vicinity of the escape raise but the site is located sufficiently distant from both that no impacts are anticipated. The other two sites (AR-03-03-02-2770/LA 153873, AR-03-03-02-2771/LA 153872) are bisected by the road and may potentially be affected by routine road maintenance.

There is one site (AR-03-03-02-2880/LA 163193) located within the footprint of the mine facilities. The site would be bisected by one of the facility roads that would be improved to provide access to the portal. The explosives shed and growth medium stockpile also overlap portions of the site. This site would be directly impacted by these facilities.

The Forest Service has determined that seven of the sites need to be tested to determine eligibility to the National Register and/or spatial extent. The SHPO has concurred with this determination (Harris and Hayden 2011, Report Number 2009-03-133). Testing of these sites may indicate that some of the sites are not eligible to the National Register and would no longer be managed by the Forest Service. Ineligible sites would not constrain project activities. On the other hand, testing could indicate that the sites are eligible to the National Register and would require data recovery. Section 106 consultation with the SHPO and consulting parties is underway and will be completed prior to the decision.

All of the sites are potentially at risk of vandalism or theft of artifacts due to the increased human presence at the worksite and improved access to the area in general.

Cumulative Effects

Cumulative effects to heritage resources consider other past, present, and reasonably foreseeable actions in the immediate mine footprint vicinity; along access roads, at La Jara Mesa and Mt. Taylor as a whole, and in the region. The cultural heritage known for the various areas extends back 11,000 to 13,000 years before the present (BP). Over time, the number and variety of sites increases, mainly as a result of the increase in native populations. After 1500 AD or so, European and Euro-American immigration resulted in increases in those populations. The cumulative effects area considered for this project is the Mt. Taylor Division of the Mt. Taylor Ranger District. This area was chosen because the majority is encompassed by the Mt. Taylor TCP, and the cultural resources in this area are an important component of the TCP.

Past activities have disturbed sites. These activities include exploratory drilling and mining, communications site development, new roads, and dispersed recreation. This project, in combination with future development, would affect other sites unless the sites could be avoided. There are documented sites within the project area that have been disturbed by road work related mining activities as recently as the 1990s.

Traditional Cultural Property

The tribes consider the past extractive activity (presence of mines and evidence of exploratory drilling) an adverse effect on Mt. Taylor. The cumulative effect of the proposed action is to increase development and use of the mountain, which would further disrupt American Indian cultural and religious activities on the mountain and impact the integrity of the mountain. The proposed activities associated with this project (drilling and digging to extract uranium ore) are regarded by the tribes as an inappropriate activity; these activities are viewed as harmful to a living entity and desecration to a sacred landscape. The cumulative nature of this proposed action, in connection with past activities and other potential development within and adjacent to the TCP, would exacerbate the loss of integrity of relationship.

Archaeological Resources

The cumulative effects area for this project is the Mt. Taylor Division of the Mt. Taylor Ranger District. This area was chosen because the majority of it is encompassed by the Mt. Taylor TCP and the archaeological resources within this area are an important part of what makes the TCP eligible to the National Register.

There are numerous past and reasonably foreseeable future projects within the Mt. Taylor Division. These include land management activities to reduce vegetative cover, improve wildlife habitat, make firewood available, facilitate rangeland management, develop and maintain electronic communication sites and transmission/utility corridors, exploratory drilling for minerals, and the development and operation of mines. With the exception of uranium mine development, most land management activities that are proposed by the Agency, or activities proposed by an external proponent can be designed in such a way to protect archaeological resources during project implementation. In most cases, there would be no adverse effect to archaeological sites in these types of projects, or adverse effects would be mitigated. As a result, implementation of these types of projects would not contribute to cumulative effects to archaeological resources. The exception is the development of mines.

There are two other proposed uranium development projects on the Mt. Taylor Division: the Roca Honda Uranium Mine and the Combined Uranium Exploratory Drilling Project. The drilling project would avoid physical impacts to all archaeological sites within the project area. Therefore, there would be no cumulative effects to archaeological resources associated with the project.

There is the potential for 11 sites to be directly impacted by the construction and operation of the Roca Honda Mine. There are additional sites that may be indirectly impacted by increased human presence within the worksite, which encompasses portions of three sections. The combination of this project with the proposed La Jara Mesa Mine could result in direct effects to a total of 18 archaeological sites. The exact effects that projects would have on these sites are currently unknown, but some sites would likely be adversely affected. The sites are being tested to determine their National Register eligibility and/or their extent. The combination of the two proposed mines could also lead to indirect effects to other archaeological resources as a result of the increased human presence leading to the potential for vandalism and theft of artifacts.

Traffic and Transportation

Affected Environment

Regional Roadway System

This section discusses existing traffic conditions in the vicinity of and affected by the La Jara Mesa Mine Project (the project), and evaluates the potential impacts of construction and operation of the project. The project would increase traffic on local and regional roadways in the vicinity of the project site and along the proposed route to the offsite mill. Trucks used to transport ore to one or more processing facilities would use the State, Interstate and U.S. highway systems for transport. For the purposes of this EIS, it is assumed that the ore would be transported to the existing White Mesa Mill in Blanding, Utah, although the actual future destination of the ore is uncertain. Possible future processing plants may be developed in New Mexico, Utah, or other surrounding states. Sites in New Mexico are under consideration for future licensing, but none have begun the licensing process as of this writing.

A draft and final generic environmental impact statement (GEIS) was completed by the U.S. Nuclear Regulatory Commission (NRC 2009) for transportation issues associated with uranium milling activities in Wyoming, South Dakota, Nebraska, and New Mexico where previous and existing in-situ leach (ISL) uranium recovery operations have been licensed by the NRC. This GEIS included the Northwestern New Mexico Uranium Milling Region that encompasses the La Jara Mesa Mine Project area.

As stated in the GEIS, all of the New Mexico Uranium Milling Site locations, including the project, have access to Interstate 40 (I-40). The primary access route to and from the La Jara Mesa site is via Forest Road 450 to a private access road to NM 605. The connection from NM 605 to I-40 is via NM 122 and NM 615 through Milan, New Mexico. A secondary access to I-40 would be provided via Forest Road 450 to NM 547 to NM 122 through the city of Grants, New Mexico. Access to and from the project would be via the primary route except in cases of emergency. A summary of the principal roadway characteristics in the vicinity of the project site is provided in table 39. Note that Forest Road 450 and the private access road are not included in the table as they would require reestablishment in some sections.

A route was determined using National Highway System (NHS) routes. A series of NHS routes provides a relatively direct route from the I-40 access nearest La Jara Mesa Mine to the White Mesa Mill in Blanding, Utah, through New Mexico, Colorado, Arizona, and Utah utilizing US 491, US 160 and US 191. Each of these routes is part of the Strategic Highway Network (STRAHNET) of national defense highways, a secondary system of NHS roads. The White Mesa Mill is located along US 191, with the access road intersecting US 191. The ore hauling truck route characteristics are described in table 40.

The NMDOT collects traffic volume and vehicle classification data for each roadway under their jurisdiction. The data are contained in the NMDOT statewide Consolidated Highway Database (CHDB) and the data listed herein are from the April 2009 printing. Table 41 provides the most currently available traffic and truck count data for roads that would support uranium mining interests. Uranium ore would be transported from the project site by truck to one or more of the regional uranium milling sites after reaching I-40 via one or more of these routes. The majority of the annual average daily traffic (AADT) data in table 41 is from 2008, with italicized data from previous years, factored to 2008 estimates by the NMDOT utilizing average growth factors.

Traffic volume data were also obtained from Web sites for the Utah DOT, Colorado DOT, and Arizona DOT for non-New Mexico routes. The I-40 volume in New Mexico is estimated based upon rural section volumes between Gallup and Milan. US 491 volumes in New Mexico were separated into four segments – Gallup, rural between Gallup and Shiprock, Shiprock, and rural north of Shiprock. The route in Colorado, Arizona, and Utah does not pass through communities with greater than 800 residents, therefore, each route is considered rural. The volumes in table 42 represent the highest anticipated volume of vehicles per day (vpd) within each segment.

Table 39. Principal access roadway characteristics

Route	Communities Served	Functional Classification	MP Limits	Type	Lanes	Width (feet)	Surface
NM 605	Milan	Major Collector	0.00-4.71	Rural	4	44	Asphalt
NM 605	Milan	Major Collector	4.71-5.40	Rural	2	24	Asphalt
NM 615	Milan	Major Collector	0.14-0.47	Rural	4	24/24	Asphalt
NM 122	Milan	Principal Arterial	32.02-32.21	Urban	4	24/24	Asphalt
NM 122	Grants	Principal Arterial	36.03-38.53	Urban	4	24/24	Asphalt
NM 547	Grants	Minor Arterial	0.00-0.90	Urban	4	24/30	Asphalt
NM 547	Grants	Minor Arterial	0.90-2.20	Urban	2/3	36-60	Asphalt
NM 547	Grants	Major Collector	2.20-8.68	Rural	2	24	Asphalt
Interstate 40	Gallup to Albuquerque	Principal Arterial		Rural	4	40/40	Asphalt

*NM (New Mexico state route); roads with medians indicate two widths (24'/24'). NM 547 from milepost (MP) 0.00 to MP 0.90 is comprised of two one-way roadways.

Source: GEIS 2009

Table 40. Truck route to White Mesa Mill characteristics

Route	Jurisdiction	Functional Classification	MP Limits	Type	Lanes	Width (feet)	Surface
Interstate 40	New Mexico	Principal Arterial	0.00 – 4.71	Rural	4	40-40	Asphalt
US 491	New Mexico	Principal Arterial	0.00 – 107.31	Rural	2-6	Varies	Asphalt
US 491	Colorado	Principal Arterial	0.00 – 6.42	Rural	2	36	Asphalt
US 160	Colorado	Principal Arterial	0.00 – 18.30	Rural	2	36	Asphalt
US 160	Arizona	Principal Arterial	434.83 – 470.83	Rural	2	32-36	Asphalt
US 191	Arizona	Principal Arterial	512.74 – 517.74	Rural	2	36	Asphalt
US 191	Utah	Principal Arterial	0.00 – 44.60	Rural	2	36	Asphalt

*Roads with medians indicate two widths (40'/40'). US 491 in New Mexico varies from a 6-lane arterial in Gallup to a 2-lane rural route for the majority of the route.

Source: GEIS 2009

Table 41. Average annual daily traffic counts for roads impacted by La Jara Mesa Mine uranium ore hauling

Road Segment	County	2008 AADT (vpd)	2008 Truck Percent	2008 Trucks (vpd)
NM 122 in Milan	Cibola	6,647	6%	400
NM 605 north of Milan	Cibola	2,839	19%	540
NM 605 north of MP 5.0	Cibola	945	53%	500
NM 615 south of NM 122	Cibola	4,092	10%	410
Interstate 40 at Grants-Milan Interchange	Cibola	21,419	30%	6,430
NM 547 at State Route 122	Cibola	7,699	6%	460
NM 547 at Lobo Canyon Rd	Cibola	4,770	5%	240
NM 547 north of Grants	Cibola	506	17%	90
NM 122 in Grants	Cibola	10,656	6%	640
Interstate 40 at Grants East Interchange	Cibola	23,493	37%	8,700

Values in *italics* are factored based upon pre-2008 counts.

Source: 2002 Quality/level of Service Handbook

Table 42. Average annual daily traffic counts for truck route to White Mesa Mine

Road Segment	State	2008 AADT (vpd)	2008 Truck Percent	2008 Trucks (vpd)
Interstate 40	New Mexico	26,504	39%	10,300
US 491 – Gallup	New Mexico	30,877	7%	2,160
US 491 – Gallup to Shiprock	New Mexico	7,626	36%	2,750
US 491 – Shiprock	New Mexico	17,265	30%	5,180
US 491 – North of Shiprock	New Mexico	4,231	24%	1,020
US 491 – Colorado	Colorado	3,400	18%	610
US 160 – Colorado	Colorado	2,400	7%	170
US 160 – Arizona	Arizona	3,959	-	-
US 191 – Arizona	Arizona	995	-	-
US 191 – Utah	Utah	2,470	-	-

Values in *italics* are factored based upon pre-2008 counts. A dash (-) is placed where no data was available.

Source: 2002 Quality/level of Service Handbook

The truck percentage and volume for US 491 through Shiprock as shown in table 42 is likely high. Shiprock is a community with over 8,000 residents and the majority of traffic on US 491 within the community are passenger vehicles. It is estimated that the truck volume and percentage listed above are approximately double the actual values, and this is corroborated by 2002 and 2005 count data that indicates truck percentages of 14 percent.

Levels of service are qualitative measures of roadway operations and capacity, ranging from LOS A – free flow, to LOS F – gridlock. LOS C or better is desired in rural areas and LOS D or better in urban areas for classified (nonlocal) roadways. LOS guidelines exist for three area types – urban, urban-transition, and rural applications. For this assessment, only the NM 547 and NM 122 roadway segments within the city of Grants qualify for urban-transition designation. US 491 in Gallup and Shiprock qualify as urban and all remaining segments are rural. Tables 43 and 44 provide the current (2008) estimated planning levels of service for each roadway potentially impacted by the project. The LOS threshold refers to the upper limit volume (in vehicles per day) that satisfies the assigned level of service for each segment.

Each of the existing roadways in the immediate project area is estimated to operate at LOS B or better under current daily traffic loading. The truck route to White Mesa Mill experiences LOS C operations between I-40 and Shiprock, NM. The urban area in Gallup, NM, should operate at LOS D or better, and the rural section north of Gallup should operate at LOS C or better. No capacity deficiencies were identified along the routes identified for project traffic. The NMDOT has designed a project for US 491 from Gallup to the Colorado state line to widen the 2-lane sections to 4 lanes. When completed, the rural roadway sections will operate at LOS B or better.

A review of reported traffic accidents was conducted for the primary and secondary routes to I-40 in the immediate vicinity of the project site. The accidents were reviewed for the years 2005 through 2007, the most recent years available through the University of New Mexico Division of Government Research (UNM-DGR). The accidents were aggregated for each route, and separated between interstate and non-interstate events. Accidents occurred within the milepost (MP) limits identified in table 39, except for interstate accidents which were referenced only at the interchange milepost. Table 45 summarizes these crash results.

Table 43. Estimated current roadway planning levels of service

Road Segment	Lanes	2008 AADT (vpd)	Level of Service	LOS Threshold
NM 122 in Milan	4	6,647	A	17,800
NM 605 north of Milan	4	2,839	A	13,125
NM 605 north of MP 5.0	2	945	A	2,600
NM 615 south of NM 122	4	4,092	A	17,800
Interstate 40 at Grants-Milan Interchange	4	21,419	B	35,300
NM 547 at State Route 122	4	7,699	B	27,900
NM 547 at Lobo Canyon Rd	2	4,770	B	6,900
NM 547 north of Grants	2	506	A	2,600
NM 122 in Grants	4	10,656	B	27,900
Interstate 40 at Grants East Interchange	4	23,493	B	35,300

Values in *italics* are factored based upon pre-2008 counts.

Source: 2002 Quality/level of Service Handbook

Table 44. Estimated truck route to White Mesa Mill planning levels of service

Road Segment	Lanes	2008 AADT (vpd)	Level of Service	LOS Threshold
Interstate 40	4	26,504	B	35,300
US 491 – Gallup	6	30,877	C	40,300
US 491 – Gallup to Shiprock	2	7,626	C	8,600
US 491 – Shiprock	4	17,265	B	29,300
US 491 – north of Shiprock	2	4,231	B	5,300
US 491 – Colorado	2	3,400	B	5,300
US 160 – Colorado	2	2,400	A	2,600
US 160 – Arizona	2	3,959	B	5,300
US 191 – Arizona	2	995	A	2,600
US 191 – Utah	2	2,470	A	2,600

Values in *italics* are factored based upon pre-2008 counts.

Source: 2002 Quality/level of Service Handbook

Table 45. Three-year crash summary

Route	Annual Crashes			Total Crashes			Total	SI
	2005	2006	2007	PDO	Injury	Fatal		
Primary Route								
NM 605-NM122-NM 615	9	3	5	12	4	1	17	29
I-40 at Exit 79, Milan	10	2	1	7	6	0	13	46
Secondary Route								
NM 547-NM 122	53	55	43	110	41	0	151	27
I-40 at Exit 85, Grants	8	2	3	10	3	0	13	23

Notes: PDO = Property Damage Only

Source: Vehicle Occupancy

The primary route through Milan – NM 605 to NM 122 to NM 615 to I-40 – has experienced approximately 11 percent as many reported accidents as the secondary route through Grants during the 3-year review period. The total number of accidents along each route, while not trivial, does not assess the relative safety associated with each route. Vehicle crash rates are more representative than the number of collisions alone because crash rates include the exposure (amount of traffic along the route), and the length of each route. The crash rates along each route from the forest road access to I-40, measured in crashes per million vehicle miles (C/MVM), are as follows:

Primary Route	0.93 C/MVM
Secondary Route	3.20 C/MVM

The primary route has a crash incidence rate much lower than the secondary route. The accident reporting indicates that the number of accidents per mile would be much less using the primary route compared to the secondary route. This supports using the secondary route only during emergency conditions.

A safety assessment was not conducted for the truck route from Milan, New Mexico, to the mill site near Blanding, Utah. Each of the truck routes are part of the strategic highway system of the Nation Highway System. This designation indicates that these routes are designed to current roadway standards and receive the highest level of maintenance. US 491 has had safety concerns in the past, but with the ongoing widening project by the NMDOT, conditions will be improved considerably.

Railroad

An existing Burlington Northern Santa Fe (BNSF) railroad line parallels I-40 through Grants and Milan in New Mexico. The railroad no longer has a station within these communities though there is a siding within the community of Milan. At this time, there is no anticipated use of the railroad for conveyance of uranium ore to a mill.

Environmental Consequences

No Action Alternative

Under the no action alternative, the project would not impact any of the transportation facilities within the project transportation study area.

Proposed Action Alternative

Construction

Reconstruction of an approximate 2 mile section of a very low volume National Forest Service Road (NFSR) 450 would be required during construction. It is anticipated that work zone traffic control would be in place during construction, and if traffic is limited to one lane operation, flagger control would be in place. Flagger zones would be limited to quarter mile long segments and no delays greater than 5 minutes would be permitted without advance warning of at least 72 hours. If closures of NFSR 450 are required for culvert construction, notice of the closure would be placed at the NM 547 intersection at least 72 hours in advance of the actual closure, and would

contain the duration of the intended closure. Unless posted as a closure, two-way traffic should be maintained during all nonconstruction periods.

The construction of the project site access at NM 605 would impact through traffic, depending upon the construction required. If a right turn deceleration lane is required, traffic control would impact traffic for approximately a half mile south of the site access and a quarter mile to the north, with notable impacts only during the hours of construction. When construction is not occurring, two full width lanes should be open to traffic. Based upon the construction, NM 605 may be reduced to one lane of traffic requiring flaggers; however, with a volume of less than 1,000 vpd (table 41), delay to traffic should be minimal.

Roadway improvement work should be limited to roadside construction except to sawcut the existing pavement to match the surface elevation for the right turn deceleration lane. If a right turn deceleration lane is not warranted and not constructed, the work area would be reduced and would occur only at the site access, further minimizing construction impacts. It is anticipated that under either scenario, construction traffic control impacts would be in effect for 60 days or less.

Project Access to the Roadway System

Access to the project site would require the improvement of existing roads. The portal area would be accessed by approximately 6.2 miles of existing roads beyond the NM 605 system, including approximately 3.7 miles of road across private property that has been allowed to naturally revegetate over the past 25 years. This road would be reestablished and graded. In addition, approximately 2 miles of NFSR 450 would be improved from its junction with the private road to the turn at the planned La Jara Mesa Mine Project portal. Final access to the project surface facility would be an improvement of approximately 0.5 mile of an existing wheel-track, unnamed National Forest Service road.

The unpaved access roads would minimally be improved to a graded, crowned road section with roadside ditches to collect stormwater from the driving surface to meet Forest Service standards. The roadway would meet Forest Service standards for a single land road with pullouts for passing. Additional improvements would include the placement of cattle guards and new cross culverts to convey drainage. The roadway would be designed to accommodate daily workers commuting to the site and would be adequate to support highway-legal trucks used to transport uranium ore from the project site.

The project access road would be designed to meet the NMDOT access requirements at the intersection with NM 605. A site traffic analysis (STA) would be required by the NMDOT for the conveyance of a legal access permit at NM 605. Given the existing traffic volumes on NM 605 at the site access, a right turn deceleration lane may be required at the site access. If required, the deceleration lane would be designed and constructed to NMDOT standards. An asphalt surface at least 24 feet wide would be required from the junction of NM 605 to the NM 605 right-of-way line, and would include intersection return radii. Illumination of the NM 605 access intersection would be required because of the 24-hour mine operations.

The secondary access for the mine site would be via FR 450 and NM 547 through Grants. Given that this is an existing intersection and the access would only be used for emergency conditions, no roadway or intersection improvements are anticipated. Sight distance at the intersection would be verified during the site design.

No improvements are anticipated for the example truck route used for this EIS. The White Mesa Mill access from US 191 in Blanding, Utah, currently has a northbound left turn deceleration lane and southbound acceleration lane to enhance safety and operations.

Transportation Operations

Truck Traffic

With a projected production rate of approximately 500 tons of uranium ore per day and using 40-ton capacity highway trucks, it is estimated that 12 to 13 truckloads of ore material would be hauled from the project site on an average daily basis. Assuming there may be some fluctuation in scheduling and loading vehicles, and to estimate a conservative maximum truck traffic volume, a total of 15 trucks per day were assumed. It is anticipated that the project would generate a maximum of 30 daily truck trips entering and exiting the site.

Truck loads would be monitored at the mine to ensure that they do not exceed the A₂ quantities of Class 7 radioactive materials. The project ore is anticipated to contain uranium (eU_3O_8) levels ranging from 0.12 to 0.30 percent with an average of 0.21 percent. Truck loads would be adjusted so that they do not exceed the maximum radiation level allowed per 49 CFR 173.403.

A transportation policy would be required for all vehicles transporting ore to the White Mesa Mill in Blanding, Utah. An example policy is attached in appendix A. All ore hauling vehicles would be required to follow the specified truck route to the facility. In addition, all trucks containing ore would have the trailers properly marked with “RADIOACTIVE-LSA” provided they do not exceed the Class 7 A₂ requirements. All trucks would also carry an emergency response plan in case of an accident that results in spillage of uranium ore or other hazardous material during transport. Additional details are included in the attached policy.

Workforce Traffic

The mine’s workforce trip generation was prepared based upon the anticipated mine shifts at full project mine production. Workforce traffic during construction would be less than during operations. The principal trip characteristics are based upon the number of workers per shift and estimated vehicle occupancy (April 1981). The project trip assumptions are based on the applicant’s plan of operations as follows:

1. There would be 110 employees at the mine, but not all at one time.
2. There would be two 10-hour shifts per day. Shift 1 would be from 7 a.m. to 5 p.m. and shift 2 would be from 5 p.m. to 3 a.m.
3. Required personnel include management, office and technical staff, supervisors, hourly staff, and longhole underground drillers.
4. Shift 1 would have 42 mine employees and 16 administrative and security personnel (total 58). Shift 2 would have 42 mine employees and 10 security/administrative personnel (total 52).
5. The mine staff do not include ore haul truck drivers, and it is assumed that they would arrive and leave during the day. It is assumed that the maximum number of entering and exiting trucks during each peak hour would be two trucks.
6. The vehicle occupancy rate for site personnel would be 1.4 persons per vehicle. The occupancy rate is assumed to be the same for each employment type.

7. It is assumed that there would be up to 10 project site visitors per day. It is assumed that none of these trips would occur during the a.m. or p.m. peak hours.
8. Of all trips, 75 percent would utilize I-40 for access to the project site. All trips would use NM 605.

The project site would generate employee, ore hauler, and visitor trips each day. The following trip generation is assumed for the site:

Trip Period	Enter	Exit
Daily		
Employees	79	79
Ore Haulers	15	15
Visitors	10	10
Total	104	104
AM Peak Hour	43	2
PM Peak Hour	39	43

The project would add approximately 208 daily trips to NM 605 and NM 122 in Milan. This number of trips would not change the level of service on any of these roadway segments. Therefore, the project will not cause significant adverse impacts to traffic.

Roadway Impacts

Additional traffic would be generated on local roadways as a result of the project. Such traffic would result from both the project site traffic and from background growth as the communities near the project grow. The background growth on project study area roadways listed in table 41 was examined between the years 2000 and 2008, based upon historical traffic volume data from the NMDOT. The annual growth rates varied from -6.17 percent to +9.4 percent, with an average annual rate on all links of +1.7 percent. Given that growth rates tend to decline over time, the 1.7 percent growth rate was applied to all roadway sections to determine the background traffic growth for the project study area roadways. Assuming a 20-year planning period (actually 22 years when the 2 years from 2008 to 2010 are added), the growth factor to apply to each roadway is 1.46. Table 46 contains the 20-year forecasts (actually 22 years) along with the planning level of service for the forecast volumes.

Table 46 indicates that no level of service changes in roadway operations are forecast as a result of background traffic growth on the project study area roadways except for NM 547 in Grants where the level of service is forecast to degrade from LOS B to LOS C, exceeding the LOS B planning level threshold by 80 vehicles per day.

Table 47 contains the 2030 forecast data for the truck route from I-40 to the White Mesa Mill in Blanding, Utah. The growth data for New Mexico roads was from the same source as the project area roadways, resulting in an annual rate of 1.7 percent. The Colorado DOT publishes 20-year growth factors for all of its roadways, and an estimated 2 percent annual background growth rate was applied to the roads in Arizona and Utah as no growth data was readily available for those

routes. This should result in conservative forecasts assuming no major development occurs along these routes.

Table 46. Year 2030 roadway volumes and planning levels of service without project

Road Segment	2008 AADT (vpd)	2030 AADT (vpd)	2030 Level of Service	2030 LOS Threshold
NM 122 in Milan	6,647	9,720	A	17,800
NM 605 north of Milan	2,839	4,150	A	13,125
NM 605 north of MP 5	945	1,380	A	2,600
NM 615 south of NM 122	4,092	5,980	A	17,800
Interstate 40 at Grants-Milan Interchange	21,419	31,330	B	35,300
NM 547 at State Route 122	7,699	11,260	B	27,900
NM 547 at Lobo Canyon Road	4,770	6,980	C	12,900
NM 547 north of Grants	506	740	A	2,600
NM 122 in Grants	10,656	15,580	B	27,900
Interstate 40 at Grants East Interchange	23,493	34,360	B	35,300

Source: 2002 Quality/level of Service Handbook

Table 47. Year 2030 truck route volumes and planning levels of service without traffic

Road Segment	2008 AADT (vpd)	2030 AADT (vpd)	2030 Level of Service	2030 LOS Threshold
Interstate 40	26,504	38,760	C	47,800
US 491 – Gallup	30,877	45,160	D	49,200
US 491 – Gallup to Shiprock*	7,626	11,150	A	15,300
US 491 – Shiprock	17,265	25,250	B	29,300
US 491 – North of Shiprock*	4,231	6,190	A	15,300
US 491 – Colorado	3,400	5,240	B	5,300
US 160 – Colorado	2,400	3,300	B	5,300
US 160 – Arizona	3,959	6,120	C	8,600
US 191 – Arizona	995	1,540	A	2,600
US 191 – Utah	2,470	3,820	B	5,300

* Roadway widened from two lanes to four lanes.

Source: 2002 Quality/level of Service Handbook

Traffic analysis was conducted based upon the 208 daily trips to be generated by the project. These trips were added only to the primary route because the secondary route would be used only in an emergency situation. The results for 2008 and 2030 conditions are summarized in table 48.

Table 48. Year 2008 and 2030 project level roadway volumes and planning levels of service

Road Segment	2008 AADT w/Site (vpd)	2030 AADT w/Site (vpd)	2008 Level of Service	2030 Level of Service
NM 122 in Milan	6,855	9,928	A	A
NM 605 North of Milan	3,047	4,358	A	A
NM 605 North of MP 5	1,153	1,588	A	A
NM 615 South of NM 122	4,300	6,188	A	A
Interstate 40 at Grants-Milan Interchange	21,627	31,538	B	B
NM 547 at State Route 122	7,699	11,260	B	B
NM 547 at Lobo Canyon Road	4,770	6,980	B	C
NM 547 North of Grants	506	740	A	A
NM 122 in Grants	10,656	15,580	B	B
Interstate 40 at Grants East Interchange	23,493	34,360	B	B

Source: 2002 Quality/level of Service Handbook

No level of service changes are anticipated as a result of the estimated 208 daily site trips being added to the existing forecast. All levels of service are considered acceptable for the respective rural or urban environments.

Table 49 contains the 2008 and 2030 level of service results for the truck route with the project. The project traffic is anticipated to add up to 30 daily trips along the truck route. Segments of US 491 in New Mexico would improve between 2008 and 2030, as a result of adding two additional lanes. The widening project is currently ongoing.

No planning level of service deficiencies are noted in table 51 as a result of adding the project site traffic.

The applicant would be responsible for ongoing road maintenance, including snow removal, to ensure safe and efficient year-round access to the project surface portal facilities area. This maintenance activity would apply to all non-State highways.

Table 49. Year 2008 and 2030 truck route volumes and planning levels of service with project

Road Segment	2008 AADT w/Site (vpd)	2030 AADT w/Site (vpd)	2008 Level of Service	2030 Level of Service
Interstate 40	26,504	38,760	B	C
US 491 – Gallup	30,877	45,160	C	D
US 491 – Gallup to Shiprock*	7,626	11,150	C	A
US 491 – Shiprock	17,265	25,250	B	B

Road Segment	2008 AADT w/Site (vpd)	2030 AADT w/Site (vpd)	2008 Level of Service	2030 Level of Service
US 491 – north of Shiprock*	4,231	6,190	B	A
US 491 – Colorado	3,430	5,270	B	B
US 160 – Colorado	2,430	3,330	A	B
US 160 – Arizona	3,990	6,150	B	C
US 191 – Arizona	1,025	1,570	A	A
US 191 – Utah	2,500	3,850	A	B

Source: 2002 Quality/level of Service Handbook

Cumulative Effects

Cumulative traffic effects for this project consider traffic activities on the site and at the nearest access road and commute route because that is where traffic is likely to have the greatest effect. Past traffic activity is not relevant to existing traffic impacts and existing roadways built in response to past and forecast traffic conditions are discussed in the affected environment above. There are no other projects in the vicinity of the project that would contribute to traffic levels that are not already addressed in this section. A new mine (Roca Honda) is being proposed northeast of the La Jara Mesa Mine by Roca Honda Resources, LLC, and is in the permitting process. Construction and operational traffic from that mine and future potential dates of occurrence are unknown at this time. Further information may be known by the time the final EIS is prepared. In any event, no changes of LOS would occur from that project on NM 605, as shown on table 43, because more than 1,500 cars and trucks would be required, or many thousands along some highways, to affect levels of service, and this is much more than would occur from a mine. Therefore, no cumulative transportation impacts are expected from this project.

Human Health and Safety

The primary health and safety issue of concern for the project is focused on radiation effects. Radon is the most common offsite radiation source and potential dose source to the public from a uranium mine. This EIS does not evaluate dose to the mine employees as they are covered by Federal health based exposure levels under authority of the U.S. Department of Labor as summarized below. Uranium is a naturally occurring element common in the earth's crust. Because uranium is radioactive, it will undergo radioactive decay, producing a number of other radioactive elements including radon, a chemically inert radioactive gas. This gas is common and found at various levels throughout the U.S. According to the EPA, 1 in 15 homes has elevated radon levels. Elevated levels are often associated with basements in areas where uranium and radon are present in the ground, or in native rock. Methods used to reduce levels of radon in homes where elevated levels are found may include increased ventilation or some means of sealing the foundation of the home from the radon in the surrounding soil.

Undisturbed uranium ore generally contains uranium and all of the 14 radioactive decay products within the uranium-238 decay chain. When uranium ore is mined, the ore is broken up and transported from the mine to the surface. This disturbance of the ore body will result in the release of radon gas into the mine air. Because radon is a gas, it will flow with the prevailing

winds and potentially expose areas beyond the immediate mine site. The aspects of such public radon exposures and the control of radon levels within the mine are discussed here.

Affected Environment

This section discusses mine characteristics that would contribute to the release of radon gas and the way it is generally controlled and regulated. Radon currently exists in the project area in the air at background conditions that are likely to be low, but which have not been measured at the site. The environmental consequences section discusses more about the radon levels that are expected in the mine.

All modern underground mines employ a mechanical ventilation system to control the level of airborne pollutants in the underground mine. The exhaust from such a ventilation system will contain the various chemical airborne contaminants typically found in an underground mine, including radon gas that has been released from the uranium ore. Federal mine regulations, enforced by the U.S. Department of Labor, MSHA, require that radon levels be maintained inside mines that meet health and safety standards for the workers. Exposure standards for workers and for the public are established by the EPA. Worker exposure is regulated by the U.S. Department of Labor, Mine Safety and Health Administration and guided by mine safety regulations in 30 CFR 57.

Radon released from a uranium mine will mix with naturally occurring outdoor background radon and will follow prevailing wind directions from the mine. Generally, radon levels at a distance of 1 kilometer (0.6 mile) from an operating uranium mine are similar to the natural background radon levels. This is because the radon gas is dispersed in the atmosphere and simply adds to the radon that is already naturally present. In contrast to radon within homes, outdoor radon, while present everywhere, is not a significant source of radiation exposure. Houses tend to trap and confine radon emanating from the soil around them. Therefore, radon in houses is generally the largest single source of radiation exposure for members of the public.

A uranium mine must maintain radon levels inside the mine that are safe for miners to work. The mine air, at those acceptable levels, is the source of offsite radon. In other words, the air in a mine, before it is exposed to and mixed with outside air, is already at levels deemed safe for the human health of workers. Such levels in the mine consider continuous worker exposure, and not the intermittent exposure that the public might encounter as visitors to the area for hunting, recreational use, visiting the mine, or from similar activities.

Federal regulations provide a large safety margin for public exposure to radon in the vicinity of uranium mines. These exposure limits are health based and designed to protect human health. Such regulations are based on published draft proposals that are the subject of comments from the public, interest groups, and health practitioners. The factor of safety included in the limit suggests that it considered other sources of background radon exposure and other radiation exposure when determination exposure limits for radon. For example, the maximum allowable annual exposure to miners working in a uranium mine is 5 rem/year (rem is a unit of radiation dose). This level of exposure has been deemed safe under Federal mining regulations. EPA regulations prescribing emission standards for uranium mines in 40 CFR Part 61 (1989) state that emissions from a mine should not create any exposure to the public exceeding 10 mrem/year. A mrem (millirem) is 1/1000 of a rem. This means that the allowable exposure level to the public, based on EPA

emission standards, is 500 times less than the level determined to be protective of human health to miners.

The regulatory limits for radon exposures of workers and the public vary from one jurisdiction to another, but the limits for the exposure of the public are generally at least 10 times lower than the limits for workers. The applicable Federal regulatory limits for radon exposures are 5 rem/year for workers and 10 mrem for members of the public, or 500 times less exposure to the public than for workers.

Environmental Consequences

No Action Alternative

If the project is not built, radon concentrations in the area are likely to stay the same. Future mines in other areas would increase the amount of radon released in the area but residences at considerable distance from these sources would not experience any measureable increase in radon levels near their homes.

Proposed Action

This section uses an analytical procedure developed by the EPA to compute the potential radiation exposures received by members of the public from the release of radon from the La Jara Mesa Mine ventilation exhaust systems, when it is in full production (500 tons of ore per day). The analysis considers potential continuous exposure to the nearest residence, assuming year-round exposure during operation of the mine. It also considers the potential public exposure near the opening of the mine raise, using the unlikely scenario of someone living (camping) next to the raise opening for 2 weeks. The raise site was selected because the public will be allowed to get closer to the raise than the mine portal itself. Two weeks was selected as the exposure level because that is the maximum length of time a campsite can be occupied under Forest Service regulations. For someone to be at the site for the 2 weeks assumed in this worst case analysis, they would need to bring in 2 weeks supply of water, fuel, and food and not leave the campsite for the entire period. Given the remote location of the raise, actual visiting time in its vicinity is more likely to be for a few minutes, if anyone drove or walked by the raise opening during the life of the mine, and not the 336 hours assumed in the analysis.

Federal Standards for Radon Emissions from Uranium Mines

Federal standards for radon emissions from underground uranium mines are found in 40 CFR Part 61, Subpart B – National Emission Standards for Hazardous Air Pollutants. The standard of exposure to the public found in Section 61.22 of the regulations is a maximum effective dose equivalent of 10 millirems per year (10 mrem/yr). The regulations require that compliance be demonstrated via the use of a computer model developed by the EPA referred to as COMPLY-R, or via the use of an equivalent approved model.

For purposes of this EIS, the authors made assumptions about mine characteristics, design, and ventilation to develop an approximation of potential emissions and eventual exposure scenarios of radon to the public. This screening level analysis was conducted with assumptions based on higher than expected risk scenarios to determine if emissions and exposure were likely to be far above, or far below, health and safety standards. The analysis was performed for the nearest

residential exposure, based on continuous 24 hour/day potential exposure to mine emissions for a year. Standards are based on exposure per year.

The analysis was also performed for the public on National Forest System lands, based on potential intermittent proximity to the mine raise portal on top of the mesa. Due to proposed security gating and anticipated access restrictions to the mine mouth by the public, exposure modeling of the visitors to the mine portal and ore handling area at the base of the mesa was not conducted. Because worker exposure to radon levels is covered by Federal safety regulations, the Forest Service has not conducted their own safety analysis for mine workers.

Data Used in Public Radon Exposure Estimates for La Jara Mesa Mine

The following parameters were used to estimate potential radon exposure to members of the public:

- Diameter of raise – 8 ft (2.4 m)
- Mean diameter of exhaust adit – 13.8 ft (4.2) m
- Release height from raise – 3.3 ft (1 m)
- Closest permanent residence – 3 miles (4.8 km) to the southwest
- Production rate – 500 tons of ore in 24-hour day (454,000 kg/day)
- Grade of ore – 0.3 percent maximum
- Total mine ventilation rate – 200,000 cfm or 94.4 m³/s (assumed rate based on typical ventilation rates for small mines)
- Airflow up ventilation raise – 20,000 cfm or 9.4 m³/s (10 percent of total flow from mine)
- Airflow out of main exhaust adit – 180,000 cfm or 85 m³/s

There are various sources of radon gas in the mine. Sources of radon gas for an underground uranium mine include the following:

- Radon gas released from the ore as the ore is broken and disturbed by blasting and haulage.
- Radon gas diffusing from the walls of the underground workings.
- Radon gas brought into the underground workings by mine water inflow.

La Jara Mesa Mine is situated above the water table; therefore, there should be no appreciable mine water inflow and this source of radon was not included. The amount of radon gas diffusing in from the walls of the underground workings would depend on many factors, including the amount of ore remaining in the walls. Radon emissions from large mines with miles of mine walls can contribute to radon emission rates. For a relatively small mine such as this project, the total surface area of rock wall exposed in the underground workings is very limited, and difficult to calculate without data on wall characteristics that are not available. Because this source is expected to be minor and hard to quantify precisely, this source of radon gas is not included.

The main source of radon gas will be from within the ore as the ore is broken up and moved about by the mining process. It was assumed as a worst case that all the radon gas present within the ore is released as the ore is mined. This is an overestimate of the radon from the production of ore,

and will lead to an overestimate of the radiation exposures of the public from ore-based radon released by the mine. This assumption also helps to compensate for the total surface area emissions.

Total amount of uranium expected to be generated per year in 455,000 kg of ore at a grade of 0.3 percent is $455,000 \text{ kg} \times 0.003 = 13,700 \text{ kg}$ or $1.37 \times 10^6 \text{ g}$ of uranium. This is also a conservative high estimate because 0.3 percent is the high end of the range of uranium concentrations expected to be found in the ore.

The model bases the radioactivity of the uranium in the ore based on its concentration and specific activity. The specific activity of U-238 is $1.23 \times 10^4 \text{ Bq/g}$. Hence the total activity of U-238 in the ore produced each day is: $1.37 \times 10^6 \text{ g/day} \times 1.24 \times 10^4 \text{ Bq/g} = 1.7 \times 10^{10} \text{ Bq/day}$. (Bq is a becquerel, a unit of radioactivity equivalent to one transformation per second, and a very small unit.) There are $3.7 \times 10^{10} \text{ Bq}$ in one curie. With these assumptions, there will be $1.7 \times 10^{10} \text{ Bq/day}$ of radon gas released by the mining process. On an average basis per second, the rate of radon release averaged over the entire day would then be $1.97 \times 10^5 \text{ Bq/s}$.

The COMPLY-R model requires a radon release rate in Curies (Ci) per second. The conversion rate between Ci and Bq is:

$$1 \text{ Ci} = 3.7 \times 10^{10} \text{ Bq}$$

This then is the calculated amount of radon predicted to be released by the mine. The potential radiation exposure to members of the public was calculated with the parameters listed above using the EPA computer model COMPLY-R. Hence the radon release rate within the underground mine is projected to be $(1.97 \times 10^5 \text{ Bq/s}) / (3.7 \times 10^{10} \text{ Bq/Ci}) = 5.3 \times 10^{-6} \text{ Ci/s}$. The following analysis evaluates the potential exposure to someone at the top of the raise, and the exposure to the nearest resident.

Radon Exposures to Temporary Occupants of Area Near Raise

For this calculation it was assumed that 10 percent of the radon from the mine is released up the raise since the airflow up the raise was assumed to be 10 percent of the total ventilation flow. Because the ventilation exhaust up the raise has been assumed to constitute 10 percent of the total mine exhaust, the radon release rate from the raise will be 10 percent of the total radon release rate or $5.3 \times 10^{-7} \text{ Ci/s}$. This may also be written as 0.00000053 Ci/s. The public radiation exposure computed using the software may be compared to the regulatory limit of 10 mrem/year.

The COMPLY-R software is set up to calculate exposures from radon releases to members of the public who are permanent residents at some distance from the raise. It can be used as a general approximation of the amount of exposure expected compared to acceptable exposure levels.

Calculations were conducted for a hypothetical permanent resident located at a distance of 100 m from the raise although no such resident exists. However, for purposes of exposure analysis, it was assumed that someone might elect to camp for 2 weeks in an area adjacent to the raise. In order to calculate the potential temporary radon exposure, the annual results from the COMPLY-R calculation for a permanent resident living 100 m from the raise were prorated by a factor of 26 to yield the radiation exposures from a 2-week “residency” 100 percent exposure period. The calculated radiation exposure to the camper was 1.4 mrem, or 14 percent of the 10 mrem/year

regulatory limit meeting EPA's health standards. Two weeks is the maximum allowable continuous stay on National Forest System lands.

Total Public Radon Exposure

While some wind speed and direction data is available for the project area, it is not clear that the data would apply in the immediate vicinity of the mine site with its rugged topography. For this reason, the EPA model was run using the software's default weather parameters. With the parameters listed above, assuming a radon release rate up the raise of 5.3×10^{-7} Ci/s and using the model's default weather parameters, the projected dose to the nearest receptor from the raise is estimated at 7.7×10^{-2} mrem/year or 0.077 mrem/year. This is 0.77 percent of, or less than 1 percent of, the regulatory limit of 10 mrem/year.

Most of the ventilation exhaust and the resulting release of radon would be from the adit into the mine which is about 700 feet below the level of the mesa, and which would likely see less wind than the exposed mesa top. If we assume that the radon released from the adit mixes with the radon released from the raise, and then flows toward the nearest permanent residence 3 miles away, the total radon exposure to the residence is expected to be up to 0.8 mrem/year. This is below (8 percent of) the regulatory limit of 10 mrem/year set by the EPA for the safety of the public. As a result, radon emissions from the mine do not pose a significant health risk to the nearest residents or to anyone who might want to camp adjacent to the raise.

Cumulative Effects

Cumulative health and safety effects from this project are evaluated near the mine site and as far away as the nearest residence (3 miles). Historical health effects are discussed in the "Legacy Health Issues – New Mexico Uranium Mining" section that follows. The analysis is focused on radon gas as it is the primary health risk concern leaving the mine site uncontrolled (as opposed to ore in licensed and covered trucks subject to Federal transport regulations). The health and safety effects discussed in this EIS are based on radioactive emissions from the mine from radon gas which is the most likely "uncontrolled" radionuclide release from the mine. Other risks are discussed from transportation and covered by Federal and State traffic ore transport regulations, and from handling and storage of hazardous materials, which are also covered by regulation and confined through appropriate storage, required containment, and routine management practices.

Cumulative exposures to radon can come from the background air, the natural ground environment, and other mines including uranium mines. Effects from this project are evaluated in the immediate vicinity of the raise opening at the top of the mesa and to the nearest residents approximately 3 miles away. Therefore, the cumulative health and safety impacts of this mine would be those that are likely to occur in the future in the vicinity of the project and that would be additive to this project's impacts.

There are no known mines proposed for La Jara Mesa or at Mt. Taylor that would create emissions at the top of the mesa that would be cumulative to the emissions projected for the raise opening. The nearest proposed mine (Roca Honda) is 8 miles away on the other side of Mt. Taylor, and no emissions data is available. The applicant owns mine claims for the La Jara Mesa Mine up to 2 miles from the opening so another raise opening close enough to create cumulative effects is even less likely because only one is proposed for this mine. Therefore, no cumulative health and safety effects are expected at the raise opening, to anyone in the vicinity of the raise.

The radon exposure effects to the nearest resident 3 miles away are 14 percent of the recommended safe dose maximum level required by Federal regulations and far below those standards. There are no other expected sources of radon, other than normal background conditions. The only reasonably foreseeable future source, the Roca Honda Mine, is 8 miles to the north. Potential emissions from that mine are not known to date but, assuming they meet emissions standards at the mine, will not create harmful levels 8 miles away. Therefore, no significant adverse cumulative health and safety impacts from radon emissions are expected.

Legacy Health Issues - New Mexico Uranium Mining

Legacy Health Issues

Among the concerns raised during scoping for the La Jara Mesa Mine were historical health issues associated with uranium mining and ore handling activities, its related health effects in New Mexico and other areas, and the extent to which this project would contribute to further similar uranium mining related health issues. Potential health and safety impacts associated with the La Jara Mesa Mine itself are discussed in the “Health and Safety” section. This section discusses historical health issues associated with uranium mining in the region, including past activities related to uranium mining, processing, waste disposal, abandoned sites, and the nuclear weapons program. The topic of historical and remaining health issues and risks that are suspected of being caused by uranium mining and milling practices that were followed many years ago, including contamination from these activities, is referred to as “legacy health issues.” The legacy is a history of contamination and various health problems left by an active uranium mining history in New Mexico that started as far back as the 1950s.

Legacy health effects stem from historical uranium mining and milling activities, particularly in the Grants Mining District of New Mexico. Such activities have included the mining, transport, processing (milling), storing, and disposing of uranium ore and waste products. Also referred to as the Grants Mineral Belt (NMDOH 2010), the area extends along the southern margin of the San Juan Basin, within Cibola, McKinley, Sandoval and Bernalillo Counties, and on tribal reservation lands. The Shiprock Mining District and Ambrosia Lake Subdistrict of the Grants Mining District are under Navajo Nation jurisdiction and administered by EPA Region 9. Remaining areas are under the jurisdiction of EPA Region 6 and the State of New Mexico.

Environmental conditions at legacy mining and milling sites are affected by the technologies used in the past, mining techniques used in the past, historical health and safety practices, regulations and enforcement, availability of funding for cleanup, and other factors. They are also affected by the location, design, and type of mine; the methods used to extract, transport, and process ore, and reclamation practices. Most of the contaminated site issues in the region include waste piles, ore processing sites, abandoned mines, and other surface facilities. Some of the contamination problems were exacerbated by mining companies who went out of business before cleaning up (reclaiming) their mine sites. This section describes the status of uranium mining and processing, with a focus on New Mexico, and describes legacy health issues and how they may relate to the proposed La Jara Mesa Mine in New Mexico.

Uranium Health Effects

Uranium metal toxicity – Uranium and its byproducts and related nuclides can cause harm through exposure or ingestion, by mouth or via inhalation. Exposure to uranium can result in both chemical and radiological toxicity. The primary human health effect associated with exposure to uranium metal itself and its compounds is kidney toxicity. This is separate from radiation effects. Uranium toxicity can result from breathing air containing uranium dust or by ingesting substances containing uranium, which then enter the bloodstream. Very high uranium intakes (ranging from about 50 to 150 mg, depending on the individual) can cause acute kidney failure and death. At lower intake levels (around 25 to 40 mg), damage can be detected by the presence of protein and dead cells in the urine, but there are no other symptoms. After exposure to lower non-lethal intake levels, the kidney can repair itself over a period of several weeks after the uranium exposure has stopped.

Radiological Toxicity – Radiological effects of uranium exposure are much more varied and potentially persistent. Several possible health effects are associated with human exposure to radiation from uranium. Because all uranium isotopes mainly emit alpha particles that have little penetrating ability, the main radiation hazard from uranium occurs when uranium compounds are ingested or inhaled. However, workers in the vicinity of large quantities of uranium in storage, or in a processing facility, also are exposed to low levels of external radiation from uranium decay products. At the exposure levels typically associated with the handling and processing of uranium, the primary radiation health effect of concern is an increased probability of the exposed individual to develop cancer during their lifetime, rather than immediate illness. Cancer cases induced by radiation are generally indistinguishable from other “naturally occurring” cancers and occur years after the exposure takes place. The probability of developing a radiation-induced cancer increases with increasing uranium exposure and intakes. The management approach to reduce that risk is to reduce the level of exposure to workers and to the public.

The extent of damage from exposure to a uranium compound depends on the solubility of the compound and the route of exposure. In most health assessments evaluating the health effects of uranium exposure, inhalation, ingestion, and external radiation are all considered. Although absorption of some soluble compounds through the skin is possible, such dermal exposures generally are not significant. For inhalation or ingestion of soluble or moderately soluble compounds such as uranyl fluoride (UO_2F_2) or uranium tetrafluoride (UF_4), the uranium enters the bloodstream and reaches the kidney and other internal organs, so that chemical toxicity is of primary importance. For inhalation of insoluble compounds such as uranium dioxide (UO_2) and triuranium octaoxide (U_3O_8), the uranium is generally deposited in the lungs and can remain there for long periods of time (months or years). The main concern from exposure to these insoluble compounds is increased cancer risk from the internal exposure to radioactivity. Ingested insoluble compounds are poorly absorbed from the gastrointestinal tract and are only retained in the body for a short time, thus generally having a low toxicity.

Today’s mining procedures include dust control to reduce the potential for inhalation; dose measurements to ensure that safe levels of exposure are not exceeded, management practices followed by miners, and in the case of underground mines, proper ventilation.

Radon – Radon gas is another exposure risk and one which is more related to mining than to processing or disposal, especially underground mining. Thus, it is more relevant to the La Jara Mesa Mine Project than to open pit mines. Radon gas exposure is somewhat different than other

forms of radionuclide exposure in that it is found naturally throughout the U.S. It has the potential for exposure to the public at large, even if not near a mine.

Radon is a naturally occurring radioactive gas found in elevated concentrations in many areas of the U.S., including basements and other underground structures. Based on radon exposure studies, the EPA has suggested that homeowners should provide extra ventilation in basements or take other measures if radon levels exceed 4 pCi/L (picocuries per liter). One common solution is an installed vacuum system that collects air under the foundation of the home and exhausts it before radon can penetrate walls and create exposure.

The EPA has found that radon gas is the number two cause of lung cancer, behind smoking, and is responsible for 21,000 lung cancer deaths per year—most of which (18,000) are from smokers, demonstrating the link between radon exposure health risk and smoking. When radon decays, it releases small radioactive particles that drift in the air. Because these radioactive particles adsorb to the surface of small particulate matter in the air, they can be inhaled if dust or small particles are inhaled. One source of small particulate matter is cigarette smoke. Radon particles can absorb to the smoke that is inhaled by smokers, move deep into the lung, and stay there while exposing the lung to radiation. There has been a correlation between smoking in uranium mines and lung cancer, and the combination of smoking and radon exposure increases cancer risk considerably. Smoking allows fine particulates to which radioactive particles have adsorbed to travel deep into the lung and attach to the surface of the lung. Absent the fine particles, the radon particles are not as likely to find a mechanism to attach to the lungs.

The New Mexico Bureau of Geology and Mineral Resources (Ulmer 2010) has stated that non-smoking miners have a 100 times greater chance of getting lung cancer than the rest of the population. Miners who smoke have been shown to be at higher risk of developing cancers than non-smoking miners. No mention of modern mining practices and ventilation control and its effects was provided. However, mine ventilation systems and dust control are control mechanisms to reduce radon exposure health risks to miners.

Legacy Health Effects, Uranium Industry Workers

One of the concerns related to legacy health effects is the potential for increased health problems in New Mexico among residents, tribal members, and uranium industry workers. A number of epidemiological studies have been conducted in New Mexico to examine the potential for such problems and they continue today. Such studies can be challenging because they need to cover dozens of years and multiple exposures to various sources, and determine if observed effects are related to the uranium industry, or to many other exposure possibilities.

Mining and Milling – A cohort mortality study of mine workers was conducted on workers engaged in uranium milling and mining activities near Grants, New Mexico, during the period from 1955 to 1990 (Boice 2008). Vital health status of these miners was tracked and determined through 2005. Standardized mortality ratio (SMR) analyses were conducted for 2,745 men and women alive after the year 1978 who had been employed for at least 6 months in the uranium mining and milling industry. Overall, mortality from all causes (SMR 1.15; 95% CI 1.07-1.23; n = 818) and all cancers (SMR 1.22; 95% CI 1.07-1.38; n = 246) was greater than average U.S. mortality rates.

Increased mortality, was seen among the 1,735 *underground uranium miners* and was due to malignant (SMR 2.17; 95 percent CI 1.75-2.65; n = 95) and nonmalignant (SMR 1.64; 95 percent CI 1.23-2.13; n = 55) respiratory diseases, cirrhosis of the liver (SMR 1.79; n = 18), and external causes (SMR 1.65; n = 58). The lung cancer excess likely was attributable to the historically high levels of radon in uranium mines of the Colorado Plateau, combined with the heavy use of tobacco products by the same miners. In the early days of uranium mining, smoking was not prohibited and ventilation was not provided in underground mines to the extent it is provided today. Among 718 *mill workers* with the greatest potential for exposure to uranium ore, no statistically significant increase in any cause of death of a priori interest was seen, i.e., cancers of the lung, kidney, liver, or bone, lymphoma, nonmalignant respiratory disease, renal disease or liver disease. Although the population studied was relatively small, the followup was long (up to 50 yrs) and complete. In contrast to miners exposed to radon and radon decay products which did show effects, uranium mill workers exposed to uranium dusts and mill products showed no clear evidence of uranium related disease. This indicated that exposure to normal levels of uranium ore was not an acute health risk; while exposure to radon within an enclosed mine did appear to cause health problems.

Another study, published in 1997 (Mapel et al. 1997) concluded that Native American miners have more nonmalignant respiratory disease from underground uranium mining, and less disease from smoking, than other miner groups, and are less likely to receive compensation for mining related disease. Uranium mining is more strongly associated with obstructive lung disease and radiographic pneumoconiosis in Native Americans than in Hispanics and non-Hispanic whites. Obstructive lung disease in Hispanic and non-Hispanic white miners is mostly related to cigarette smoking. Native Americans have the highest prevalence of radiographic pneumoconiosis, or lung disease caused by dust in the lungs and is less likely to meet criteria for compensation. This disease can be caused by coal dust, silica, or other sources as well.

Mining History of New Mexico

Because there was very little regulatory framework in place during the earlier (pre-1990s) round of uranium mining, New Mexico has been left with what is referred to as a legacy of environmental contamination from these activities (NMBGMR). According to a University of Michigan study, mining began in earnest in the Southwest United States after World War II, when atomic weapons were being developed. Escalation of the Cold War between the United States and the Soviet Union sent workers to uranium mines to mine the ore for processing into nuclear weapons. More than 15,000 people have mined uranium or worked in ore processing mills in the Southwest since the 1940s. Some 13 million tons of uranium were mined while the mines were in operation. The Vanadium Corporation of America and Kerr-McGee Corporation were the principal owners of these mines.

Mine Types – Uranium mines are generally either open pit, underground hard rock mines, or in situ leach mines. Open pit and underground hard rock mines can process (mill) the ore onsite, or instead can ship the ore offsite for processing. In situ leach processes will leach the uranium out of rock in place, far underground, by pumping chemicals from the surface into the underground ore deposit and bringing uranium to the surface in solution for further processing. The overall footprint and potential for exposure and contamination is generally less with an underground mine, because it is generally smaller in scope and works with a more confined ore. This is especially true if processing is done offsite. Other factors affecting overall contamination and

health risk potential include the presence or absence of groundwater, mine depth, and waste rock handling and characteristics.

Ore Processing – Ore can be processed (milled) onsite with either mine type. Open pit and underground mines can also haul ore to a treatment (milling) facility where it is exposed to acid to leach out the mineral. Surface exposure of ore to water and chemicals is referred to as a heap leach process. This process can be done at the mine or at offsite processing facilities. Ore can also be processed in situ using acids or other chemicals to leach out the mineral in place, far underground, and then pump the leachate to the surface to recover the uranium. The advantage of the in situ leach process is lower worker exposure, potentially lower recovery costs, and the elimination of a waste tailings pile. Disadvantages include potential groundwater contamination and a permanently contaminated underground area upon completion, although surface areas are generally less affected.

Mill Tailings – Mill tailings are the waste products remaining after uranium ore has been processed into uranium (yellow cake) for further refinement at a finishing plant. The La Jara Mesa Mine will not produce mill tailings. They would be generated at an offsite processing facility licensed by the Nuclear Regulatory Commission or the state, depending on the facility. Mill tailings are one of the legacy health issues in New Mexico. Radiation exposure to the public from uranium tailings can occur from direct exposure to the surface, ingestion of contaminated food or water, or in rare cases from exposure to materials made from the tailings, including fill materials.

Legacy Health Effects Assessment and Remediation

In 1990, a Federal law was passed known as the Radiation Exposure Compensation Act of 1990 (RECA) (Eichstaedt 1994). The law required \$100,000 in “compassion payments” to uranium miners diagnosed with cancer or other respiratory ailments (Eichstaedt 1994; Benally Sr. 1995). To qualify for compensation, a miner had to prove that s/he had worked in the mines and was now suffering from one of the diseases on the compensation list (Eichstaedt 1994; Benally Sr. 1995) or were otherwise exposed to radiation from atomic bomb testing from the 1940s to the 1960s. In 2000, additional amendments were passed which added two new claimant categories (uranium mill and ore workers, both eligible to receive as much money as uranium miners), added additional geographic regions to the “downwinder” provisions, changed some of the recognized illnesses, and lowered the threshold radiation exposure for uranium miners. In 2002, additional amendments were passed to improve coverage. The law expanded the downwind exposure area to include seven states and funded a study of health impacts on families of uranium workers and people living near uranium development. A later proposed bill would add all of New Mexico, Arizona, Colorado, Idaho, Montana, Nevada, and Utah in areas defined as downwind from atomic tests (AP Apr. 20, 2010). This legislation expands existing compensation programs for those who may have been harmed by the uranium industry.

Current Mine Safety Regulations

Part 61 B of 40 CFR specifies national emissions standards for radon from underground mines. These standards are designed to protect the public and apply to any uranium mine with a production capacity of 100,000 tons of ore. They require mine operation and radon emission limits from ambient air leaving the mine to limit any member of the public to receive a dose of 10 mrem per year. Thus, the actual allowable mine emission rate would depend on the proximity of

the public to the mine, rate of emissions and radon concentrations in the mine, and to a lesser amount, the ambient concentrations of radon in the air. Worker exposure must meet minimum standards accomplished through ventilation resulting in ventilation exhaust concentrations that must be under safe worker thresholds. The human health and safety analysis in this EIS selected the highest potential exposure level that could reasonably be assumed for the public, since the nearest residence is actually miles away. The assumption and analysis is included in the “Human Health and Safety” section.

Current Legacy Health Investigations and Activities

HRSA Compensation Program – The Health Resources and Services Administration has been tracking and attempting to compensate for health claims related to radiation exposure. Through 2007, \$577 million in claims have been paid. Table 50 indicates the categories of payments made to employees of the uranium mining industry as of 2007. As of February 2011, 23,500 claims under the act were approved (expending a total of \$1.6 billion).

Table 50. Uranium worker compensation - April 1992 through June 2007

Category	Claims Approved	Claims Denied	Claims Pending	Total Payments
Uranium Miner	4,560	2,661	208	\$455 million
Uranium Miller	1,000	239	33	\$100 million
Uranium Ore Transporter	217	70	7	\$22 million
Total	5,777	2,970	248	\$577 million

Uranium Mill Tailings Radiation Control Act (UMTRA) – This act of Congress in 1978 was passed to ensure that uranium mill tailings be managed and cleaned up as appropriate, and that every reasonable effort be made to provide for the stabilization, disposal, and control in a safe and environmentally sound manner of such tailings in order to prevent or minimize radon diffusion into the environment and to prevent or minimize other environmental hazards from such tailings. Title I of UMTRCA designated 22 inactive uranium ore processing sites for remediation, including Shiprock and Ambrosia Lake, New Mexico. Remediation of these sites resulted in the creation of 19 disposal cells that contain encapsulated uranium mill tailings and associated contaminated material. These sites are currently managed by the Office of Legacy Management within the U.S. Department of Energy (USDOE). When the act was passed, there were a number of active processing sites that are now covered under Title II of the act and were licensed by NRC. The USDOE currently administers these sites.

Shiprock Site Cleanup – This site is licensed to DOE and was turned over to the Office of Legacy Management in 2003. A groundwater cleanup and management plan is in effect at this site and will continue.

Ambrosia Lake Site Cleanup – This abandoned mill processing site located about 25 miles north of Grants was remediated between 1987 and 1995. Materials have been encapsulated in an engineered disposal cell and isolated from the environment, but will be monitored by the USDOE and the encapsulated materials, according to the USDOE fact sheet on the site, will be

“potentially hazardous for thousands of years.” This is an abandoned processing site and not a mine.

USDOE/Corps FUSRAP MOU – In 1999, the USDOE signed a memorandum of understanding with the U.S. Army Corps of Engineers to take over a remedial action program (RAP) for formally used sites (FUS) involving the cleanup of areas used for atomic bomb making, nuclear fuel rod processing and manufacture, and research. Some of these sites are in New Mexico as well, such as the sites at Acid Pueblo Canyon, Bayo Canyon, and Chupadera Mesa site northeast of Bingham, New Mexico. These sites have been remediated and are not directly related to mining activities, but contribute to the legacy of uranium production and handling in New Mexico.

EPA Uranium Cleanup Enforcement Actions – In September 2010, the EPA entered into two enforcement actions related to cleanup of uranium contamination at the Navajo Nation and Hopi Reservation; one involving the control of radium (a decay product of uranium) from the Quivira Mine site near Gallup, New Mexico; the other a comprehensive investigation of the levels of uranium and other contaminants in the waste, soils, and groundwater at the Tuba City Dump Site in Arizona. To date, two New Mexican uranium mills have been remediated. The Phillips Uranium Mill in Ambrosia Lakes cost \$40 million to remediate 3.1 million tons of tailings. The Shiprock Mill cost \$25 million to remediate 1.7 million tons of tailings; and the Homestake Mill with its 22 million tons of tailings to remediate and the groundwater issues will probably far exceed the \$56 million suggested by the NRC.

Future Uranium Mining Health Legacy Activities – Grants Mining District

Region 6 EPA has developed a 5-year plan that is intended to compile all activities contributing to the identification and cleanup of legacy uranium milling and mining activities in the Grants Mining District in the State of New Mexico (EPA 2010). Assessment efforts will be coordinated among Federal, State, and tribal participants responsible for protecting human health and the environment. The authorized organizations will implement appropriate laws, regulations, and policies within their jurisdiction to accomplish cross-organizational activities. Although this plan is specific to the Grants District, it is anticipated that some of the actions adopted here may be applied elsewhere. A separate plan for the Ambrosia Lake District is underway and is under the jurisdiction of the Navajo Nation.

The goal of the 5-year plan is to promote and advance the work needed to help restore and preserve the natural and cultural resources in the Grants Mining District and to ensure protection of human health for future generations. There are six objectives in the plan which will be implemented by the State of New Mexico or the Federal Government:

1. Assess water resources for contamination. Test and evaluate potential groundwater and well contamination to evaluate the impacts of legacy uranium sites and historical activities.
2. Evaluate and clean up abandoned mine sites. This includes screening of mine sites in the Poison Canyon area in 2009; assessment and abatement of 13 legacy uranium mines in the Ambrosia Lake and Laguna subdistricts; and cleanup on Bureau of Land Management (BLM) lands under CERCLA (Superfund).

3. Assess, clean up, and manage old uranium processing sites, including USDOE monitoring and maintenance at the Anaconda Bluewater mill, Ambrosia Lake-Phillips mill, and L-Bar mill. NRC is also overseeing cleanup of the Homestake Mining and Ambrosia Lake-Rio Algom mills in the Ambrosia Lake subdistrict.
4. Assess and clean up radiation contaminated structures in the region by the EPA under Superfund.
5. Continue investigations and cleanup of the Jackpile open pit mine site which mined from 1953 to 1982. EPA is funding legacy activity investigations under Superfund and working under a MOU with the Laguna Pueblo.
6. Conduct human health screening led by the New Mexico Department of Health.

Each of the six activities has its own funding, time line, responsible agency(ies) and management plan details that are discussed in the overall plan. A total of 96 mines are under consideration within the plan.

The plan describes EPA's ongoing Superfund work at the major uranium mines in the district. This includes extensive cleanup activities at:

- The Homestake Mining Mill site and area. The mill operated between 1958 and 1990, and was dismantled from 1993 to 1995.
- The UNC uranium processing mill in McKinley County which operated from 1977 to 1982.
- The UNC Church Rock mine that operated from 1967 to 1982 next to the Navajo Reservation. Extensive soil remediation activities commenced in 2006 and 2007.

Ongoing Research and Investigations

Uranium Millers and Miners Study – One recent study related to residents as a result of exposure to legacy uranium issues in New Mexico and included in this analysis was published in September 2010 (Boice et al. 2010). It evaluates cancer mortality during 1950-2004 and cancer incidence during 1982-2004 among Cibola County residents. The total numbers of cancer deaths and incident cancers were close to that expected in the general population. Lung cancer mortality and incidence were significantly increased among men but not women. Similarly, among the population of the three census tracts near the Grants Uranium Mill, lung cancer mortality was significantly elevated among men but not women. Except for an elevation in mortality for stomach cancer among women, which declined over the 55-year observation period, no significant increases in SMRs or standardized incident ratios (SIRs) for 22 other cancers were found.

Although the causes of these cancers cannot be drawn from these ecological data, the excesses of lung cancer among men seem likely to be due to previously reported risks among underground miners from exposure to radon gas and its decay products. Smoking, socioeconomic factors, or ethnicity may also have contributed to the lung cancer excesses observed in the study. The stomach cancer increase was highest before the uranium mill began operation and then decreased to normal levels. With the exception of male lung cancer, this study provides no clear or consistent evidence that the operation of uranium mills and mines adversely affected cancer incidence or mortality of county residents.

CDC Pregnancy and Children's Health Assessment – The legacy health issues associated with uranium mining, transport, milling, and disposal continue to receive attention in the United States including the desert Southwest and New Mexico. For example, the Center for Disease Control and Prevention announced its cooperative agreement with the University of New Mexico Health Sciences Center in August 2010, for a \$1 million a year, 3-year study on pregnancy outcomes and child development in relation to uranium exposure among Navajo mothers and infants living on the Navajo Nation.

Conclusion

The health risks and exposure pathways of uranium mining are well known. Past activities conducted under lax regulations, lack of closure bonds, and limited oversight have left contaminated sites that are being investigated and remediated by State and Federal agencies in New Mexico and elsewhere. Lung cancer among men in Cibola County is more common than other parts of the State and the United States, but other cancers among the general population in New Mexico have not been shown to be elevated. Additional health effects studies continue.

Many sites were closed and abandoned without reclamation, leaving mill tailings and other contaminants at the sites. Some cleanup projects have been completed and others are underway, under the oversight of the NRC, BLM, EPA, and the State of New Mexico. No processing or mill tailings will exist at the La Jara Mesa site.

The contamination left by open pit mining practices and abandoned uranium milling properties is not expected at the La Jara Mesa Mine, as it is proposed as an underground mine with no onsite milling. Existing and new mills are regulated and licensed by the NRC or by some states under equivalent regulations. Today's underground mining procedures include management practices such as dust control, ventilation, prohibition of smoking, radiation monitoring, radon concentration standards, reclamation plans, and financial assurance for reclamation. Related requirements to reduce health risks and ensure reclamation are much different than the practices followed in the 1900s. The lack of open pit mining, leachate treatment, ore milling, in situ leachate handling, and wastepile disposal; and the requirements for ventilation and similar health and safety requirements of current uranium mining regulations suggest that there is little or no connection between the legacy health issues of uranium mining and processing in the past, and health and safety effects from the proposed La Jara Mesa Mine.

Short-Term Use of Resources vs. Long-Term Productivity

The requirement to discuss this topic comes from the National Environmental Policy Act (NEPA) in Section 102 (C)(iv) and refers to the use of a site or resource for a short-term use or value while eliminating its potential for another use that might result in a greater level of productivity over the long term. For example, cutting down a commercial forest for a shopping center would eliminate the timber production capacity of a site and its long-term CO₂ consumption potential. Such an impact would then be compared to the relatively short-term use of the land as a shopping center or other future uses. This relationship, when important, can then be described and evaluated. Similar examples might include a land development that prevents access to mineral reserves, or use of productive farmland for a landfill that would eliminate agricultural production permanently.

Consequences of Proposed Action

Existing productivity of the site and areas around it includes vegetative growth used for cattle grazing, for deer or elk grazing at the base of or top of the mesa, and for habitat. It is not used for timber growth or harvest, for farming, or any aquatic productivity uses as there is no water on or near the site.

The Lara Jara Mesa Mine Project site would be mined for uranium to remove underground ore resources. After completion of the mining phase, the project site would be restored and reclaimed as required by the Forest Service. Once reclaimed, the site would return to the same uses of the land that occur today. This would include open range cattle grazing, recreational uses, and wildlife value. Therefore, development of this site for a mine would not eliminate the potential for long-term productivity of this land. As a result, no significant impacts to long-term productivity are expected to occur from the proposed project.

Irreversible and Irretrievable Commitments of Resources

NEPA Section 102(C) (v) requires a discussion of whether implementing the proposed action would, for any reason, irreversibly commit resources that would no longer be available for other purposes. Examples might include a commitment to consume resources that are then no longer available for other purposes (such as fuel), or that cannot be recycled or reused in some way. This would occur if a project used an enormous amount of resources, which are lost or consumed and no longer available. Such a commitment is intended to be described and then compared with the benefits of the project to compare those benefits to the irreversible commitment of such resources.

Consequences of the Proposed Action

The resources to be committed for this project involve typical amounts of steel, iron, concrete, and fuel required to construct a mine to extract uranium ore. Project equipment and construction commuters would use fuel during the construction development phase of the mine. The amount of construction resources used for such a mine (e.g., gravel, cement, iron, etc.) is expected to be minor and insignificant. No significant impact on, or demand for, construction material resources is anticipated. During operation of the mine, fuel resources would be consumed by ore trucks hauling ore to an offsite processing facility. Considering the number of trucks per day involved in this transport, no significant impacts to gasoline or diesel resources would occur in the State or the region. Some materials such as steel and concrete may be reclaimed/recycled when the project is completed and the site reclaimed, fuel used during construction and operation is irretrievable. Water used at the site is a renewable resource and is not an irreversible use of resources.

Uranium ore is mined and processed at a uranium processing mill into a pure uranium form for future uses such as conversion to fuel rods as a fuel to generate nuclear power. Once used, at this present state of technology it cannot be used again and is, therefore, a nonrenewable source of energy. Nuclear power does not emit combustion pollutants and contribute to greenhouse gases in the earth's atmosphere. The use of uranium ore for nuclear power may displace the use of fossil fuel combustion for the generation of electricity when it is provided to existing nuclear power plants or for new plants in the future. This would help conserve such fossil fuel resources and potentially reduce overall greenhouse gas levels.

Mining and recovery of the uranium ore would put this resource to use and would be irretrievable. This meets the need for the project and is not an adverse impact. Therefore, this project will consume fuels during construction and operation which is an irretrievable but not significant use of fuels resources. If the uranium resulting from this project is used to generate baseload power, it would displace other potential nonrenewable fuel sources such as coal or natural gas. No significant adverse use of resources would occur from this project.

Unavoidable Adverse Effects

No Action Alternative

Under the no action alternative, none of the impacts discussed here would occur. Additional drilling and exploration might occur on the mesa. If nuclear fuels were not available to displace fossil fuels as a result of this mine not operating, then increased greenhouse gas emissions might be an unavoidable adverse effect. No other unavoidable adverse effect is expected from no action.

Proposed Action

The proposed action alternative would result in the impacts discussed in this EIS during the construction and operation of the project during the 20+ years of the mine. After mine closure, most of the impacts would cease to occur and the reclamation plan provides for returning the mine footprint to pre-existing habitat conditions. The proposed well would either be closed, capped, or made available for other uses. The water pipeline could be retrieved and recycled or, to avoid impacts, closed and left buried in the road ROW. The electrical transmission line could be left or removed, based on agency requirements.

Table 51 lists the impacts described in this EIS, proposed mitigation measures, and whether there would be unavoidable adverse effects following mitigation. Resources without expected adverse effects are not listed. Additional potential mitigation suggested by agencies is included in appendix B.

Table 51. Summary of impacts, proposed mitigation measures, and unavoidable adverse effects

Resource Element	Impacts and Mitigation Measures	Unavoidable Adverse Effect
Geology/Soils	A total of 16.4 acres of land would be disturbed from site mining facilities and operations, as well as access road improvements or widening. Mitigation includes standard BMPs, and specific soil handling procedures outlined in the reclamation plan.	Disturbance and compaction of 16.4 acres of soil at portal and potentially along access roads. Topsoils would be replaced and revegetated at the end of mining operations per measures outlined in the reclamation plan. Removal of uranium ore is unavoidable.
Vegetation	A total of 16.4 acres of vegetation would be removed; no impacts to threatened and endangered plant species; all disturbed areas would be restored.	Loss of 16.4 acres of vegetation for the life of mine operations. Vegetation would be restored through provisions set forth in the project's reclamation plan during operation and at the end of the mining operation.

Resource Element	Impacts and Mitigation Measures	Unavoidable Adverse Effect
Wildlife	A total of 16.4 acres of potential habitat would be removed; local wildlife would be displaced to adjacent areas or lost; potential impact to Gunnison's prairie dog – no decline in population expected. All disturbed areas would be restored.	Loss of 16.4 acres of wildlife habitat for the life of mine operations. Some displacement and potential direct impact on associated wildlife.
Rangeland	A total of 16.4 acres of forage/grazing habitat would be removed; temporary noise impacts may deter cattle from site. All disturbed areas would be restored.	Loss of 16.4 acres of forage would be removed within grazing allotments 02208, 001, and 003 during the life of mine operations. Trucks and mining operation vehicles present small increase in risk to livestock being struck by traffic.
Energy and Natural Resources	Fuel consumed to operate vehicles and equipment; energy consumed to process ore.	Permanent removal of mineral resources from the underground workings.
Visual Resources	Minor to moderate seasonal impact to persons using the area. Barely visible from NM 605. Facilities would be painted to be subordinate to the environment.	Facilities and power lines would have minor to moderate, seasonal visual impact to back-country users and hunters.
Cultural Resources	Seven sites directly impacted; testing recommended on seven sites for eligibility. Avoidance or potential data recovery provided for mitigation. Adverse impact to the Mt. Taylor TCP. Road location could avoid some sites.	Seven sites would be directly impacted from planned project activities. Effects on TCP eligible property, Mt. Taylor.
Human Health and Safety	Very low health risk from exposure to radiation and/or contaminated soil or water. Radon emissions and exposure to the public predicted to be below exposure standards.	Workers and the public would be exposed to project emissions. Exposure levels would meet mine safety regulations and fall far below allowable public exposure standards for radiation.

Chapter 4. Consultation and Coordination

Consultation

This section discusses the consultation and coordination conducted between the Forest Service team and agencies, tribes, and the public. It also includes the interdisciplinary team reviewers and contributors to this EIS and a list of preparers of the document. The final EIS will expand this section to update any Section 106 consultation, agency permitting activities, and additional comments and consultation activities conducted after release of the EIS, including cooperating agency review, and the EIS public review and comment process.

Notice of Intent and Scoping

A notice of intent (NOI) was published in the Federal Register announcing the intent to prepare this EIS in May 13, 2009. The notice announced the preparation of this EIS and announced opportunities for public involvement including scoping meetings which were held on May 20 and 21, 2009, in Grants and Gallup, New Mexico. A summary of the scoping comments was compiled in September 2009 and is summarized in the “Summary” section of this EIS.

Tribal Governments

The Forest Service initiated tribal consultation as required by the National Historic Preservation Act with the following tribes. This consultation included meetings, correspondence, and documentation of tribal comments and concerns by the Forest Service. The consultation is ongoing.

- Acoma Pueblo
- Zuni Pueblo
- Laguna Pueblo
- Hopi Tribe
- Navajo Nation
- Sandia Pueblo
- Jemez Pueblo
- Jicarilla Apache

State Agencies

The Forest Service conducted early coordination meetings with the State of New Mexico agencies with responsibility for mining authorization and oversight. The Minerals and Mining Division requested cooperating agency status, which was approved by the Forest Service on September 3, 2009. The Forest Service, by letter dated September 3, 2009, invited the New Mexico Office of the State Engineer, the New Mexico Ground Water Quality Bureau (GWQB), and the New Mexico Department of Game and Fish (NMDGF) to participate as cooperating agencies. The GWQB and NMDGF accepted cooperating agency status and the Office of State Engineer declined to participate as a cooperating agency.

List of Agencies, Organizations and Persons to Whom Copies of the Draft EIS Were Sent

This draft EIS has been distributed to individuals who specifically requested a copy of the document. In addition, copies have been sent to the following Federal agencies, federally recognized tribes, State and local governments, and organizations.

Federal Agency	Location
U.S. Environmental Protection Agency (EPA), Office of Federal Activities	Washington, DC
Advisory Council on Historic Preservation	Washington, DC
U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service	Riverdale, MD
Natural Resources Conservation Service National Environmental Coordinator	Washington, DC
USDA, National Agricultural Library	Beltsville, MD
USDA, Office of Civil Rights	Washington, DC
National Marine Fisheries Service, Habitat Conservationists Division	Long Beach, CA
U.S. Army Engineer Division, South Pacific	San Francisco, CA
EPA Region 6	Dallas, TX
U.S. Department of the Interior Director, Office of Environmental Policy and Compliance	Washington, DC
U.S. Coast Guard (USCG)	Washington, DC
Southwest Region Office of the Regional Administrator Federal Aviation Administration	Fort Worth, TX
Division Administrator Federal Highway Administration	Santa Fe, NM
U.S. Department of Energy Director, Office of National Environmental Policy Act (NEPA) Policy and Compliance	Washington, DC

Tribe	Location
Acoma Pueblo	Acoma, NM
Laguna Pueblo	Laguna Pueblo, NM
Zuni Pueblo	Zuni, NM
Jemez Pueblo	Jemez Pueblo, NM
Sandia Pueblo	Bernalillo, NM
Hopi Tribe	Kykotsmovi, AZ

Jicarilla Apache Tribe	Dulce, NM
Navajo Nation	Window Rock, AZ
Ramah Chapter Navajo Nation	Ramah, NM
To'hajilee Chapter Navajo Nation	To'hajilee, NM
Thoreau Chapter Navajo Nation	Thoreau, NM
Baca/Prewitt Chapter Navajo Nation	Prewitt, NM
Casamero Chapter Navajo Nation	Prewitt, NM
Crownpoint Chapter Navajo Nation	Crownpoint, NM
Smith Lake Chapter Navajo Nation	Smith Lake, NM
Mariano Lake Chapter Navajo Nation	Smith Lake, NM
Whitehorse Lake Chapter Navajo Nation	Cuba, NM
Ojo Encino Chapter Navajo Nation	Cuba, NM
Torreon Chapter Navajo Nation	Cuba, NM

Copies of the EIS will be provided to the following individuals and organizations that expressed an interest in the project or commented on the project during scoping meetings in Grants and Gallup, New Mexico, and provided an address.

Person, Agency, or Organization	Location
WildEarth Guardians	Santa Fe, NM
Center for Biological Diversity	Flagstaff, AZ
McKinley County Commissioners	Gallup, NM
Cibola County Commissioners	Grants, NM

Preparers and Contributors

The following persons contributed to preparation of the EIS or reviewed the document.

Consulting Staff

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References

- Adamson, R. D. and A. J. Betts. 1983. La Jara Mesa Property – Dena Rich Deposit, T. 12 and 13 N., R. 9 W., Cibola and McKinley Counties, New Mexico. A report on geology, mineralization, reserves, metallurgy, and mine access and development. Unpublished. September 16, 1983. p. 12.
- Balda, R. P. 2002. Pinyon Jay (*Gymnorhinus cyanocephalus*). The birds of North America Online, No. 605 in A. Poole and F. Gill, editors. Ithaca: Cornell Lab of Ornithology. <http://bna.birds.cornell.edu/bna/species/605>.
- Baldwin, J. A. and D. R. Rankin. 1995. Hydrogeology of Cibola County, New Mexico: United States Geological Survey Water-Resources Investigation Report 94-4178, prepared in cooperation with the New Mexico Bureau of Mines and Mineral Resources and the New Mexico Office of the State Engineer.
- Barnes et al. 1976 Models for the Interpretation of Frequency Stability Measurements, NBS Technical Note, 683
- Benedict, Cynthia Buttery and Erin Hudson. 2008. Mt. Taylor Traditional Cultural Property Determination of Eligibility Heritage Resource Report # 2008-03-021 USDA Forest Service, Cibola National Forest, Albuquerque, NM.
- Benally Sr. 1995 Navajo Uranium Miners Fight for Compensation, Motion magazine, 1995.
- Boice, J. D. Jr., M. T. Mumma, W. J. Blot. 2010. Cancer Incidence and Mortality in Populations Living near Uranium Milling and Mining Operations in Grants, New Mexico, 1950-2004, in: *Radiation Research*, ahead of print, Sep. 13.
- Boice, J. D. Jr, S. S. Cohen, M. T. Mumma et al. 2008. Journal of Radiological Protection, Vol. 28. A cohort study of uranium millers and miners of Grants, New Mexico, 1979-2005, No. 3 (Sep), pp. 303-325.
- State of California Department of Transportation (CalTrans). 2004. Transportation- and Construction-Induced Vibration.
- Continental Divide Electric Cooperative, Inc. (CDEC). 2009. Available online at: <http://www.cdec.coop/About/Service-Area.cfm>. Accessed on July 16.
- Chapman, Wood and Griswold, Inc. 1979. Geologic map of Grants uranium region. New Mexico Bureau of Mines & Mineral Resources, Geologic Map 31.
- Cibola National Forest (Cibola). 2008. Migratory bird monitoring report for the Cibola National Forest. Unpublished data.
- Code of Federal Regulations, Title 40. Available online at: http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?tpl=/ecfrbrowse/Title40/40tab_02.tpl. Accessed Online September 19, 2009.
- Cooper, J. B. and E. C. John. 1968. Geology and Ground-Water Occurrence in Southeastern McKinley County, New Mexico: New Mexico Office of the State Engineer Technical Report 35.
- Cordell, Linda S. 1997. Archaeology of the Southwest, 2nd edition. Academic Press, NY.
- Council on Environmental Quality, Executive Office of the President. 1997. Environmental Justice Guidance under the National Environmental Policy Act, December 10.

References

- Dello-Russo, Robert. 1999. Climatic Stress in the Middle Rio Grande Valley of New Mexico: An Evaluation of Changes in Foraging Behavior during the Late Archaic/Basketmaker II Period. Unpublished Ph.D. dissertation, Department of Anthropology, University of New Mexico, Albuquerque, NM.
- Desert USA.com Web site. Available on line at: <http://www.desertusa.com/Cities/nm/grants.html>. Accessed September 21, 2009
- Dick-Peddie, W. A. 1993. New Mexico Vegetation: Past, Present, and Future. UNM Press, Albuquerque, NM, USA.
- Ecosystems Management, Inc. 2009. Biological Assessment, Mineral Exploration for the La Jara Mesa Project Mt. Taylor Ranger District, Cibola National Forest, Cibola, NM.
- Environmental Restoration Group. 2010. Technical memorandum to Laramide Resources Ltd. dated March 25.
- Eichstaedt, Peter H. 1994. If You Poison Us: Uranium and Native Americans, Sante Fe, Red Crane Books.
- Findley, J. S., A. H. Harris, D. E. Wilson, and C. Jones. 1975. Mammals of New Mexico. University of New Mexico Press, Albuquerque, NM, USA.
- Fitch, D. C. 1980. Exploration for uranium deposits, Grants mineral belt. In: C.A. Rautman (ed) Geology and mineral technology of the grant uranium region 1979. New Mexico Bureau of Mines and mineral Resources, Mem. 38. pp. 40-51.
- Gallup, New Mexico. 2009. Official home page for the community of Gallup, New Mexico. Available online at <http://www.ci.gallup.nm.us/>. Accessed July 16.
- Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities (GEIS), May 2009, prepared by the U.S. Nuclear Regulatory Commission (NRC 2009) Office of Federal and State Materials and Environmental Management Programs and the Wyoming Department of Environmental Quality, Land Quality Division.
- Golder Associates Inc. (Golder). 2009. La Jara Mesa Mine Project, Scoping Summary Report, September 3.
- Golder. 2010. Technical Memorandum, Reconnaissance Survey of Jurisdictional Waters of the United States Downgradient from the La Jara Mesa Project Site. October 8.
- Gordon, E. D. 1961. Geology and Ground-Water Resources of the Grants-Bluewater Area, Valencia County, New Mexico: New Mexico Office of the State Engineer Technical Report 20, Prepared in cooperation with the United States Geological Survey.
- Grants, New Mexico. 2009. Official home page for the community of Grants, New Mexico. Available online at <http://www.grants.org/>. Accessed July 16.
- Guzy, M. J. and P. E. Lowther. 1997. Black-throated Gray Warbler (*Dendroica nigrescens*). The birds of North America Online, No. 319 in A. Poole and F. Gill editors. Ithaca: Cornell Lab of Ornithology. Available online at: <http://bna.birds.cornell.edu/bna/species/319>. Accessed September 2009.
- Harris, C. M. 1991. Handbook of Acoustical Measurements and Noise Control. Third Edition. McGraw-Hill, Inc. New York, NY.

- Harris, Nina, Garth Hayden and Kate Wright. 2009. Results of a Cultural Resource Survey of 6.2 Miles of Roads (103 Acres) on Private and Forest Lands, and Approximately 22 Block Acres for Mine Facilities and an Escape Raise in the Cibola National Forest, Mt. Taylor Field Office, Cibola County, New Mexico. On file U.S. Forest Service, Cibola National Forest, Albuquerque, NM.
- Hoover, R. M. and R. H. Keith. 1996. *Noise control for buildings, manufacturing plants, equipment, and products*. Houston, TX: Hoover and Keith, Inc.
- Homestake Mining Company of California (Homestake Mining Co.). 2010. 2009 Annual Monitoring Report / Performance Review for Homestake's Grants Project Pursuant to NRC License SUA-1471 and Discharge Plan DP-200.
- Kelley, Klara B. 1982. Anasazi and Navajo Land Use in the McKinley Mine Area Near Gallup, New Mexico, Volume Two: Navajo Ethnohistory. Office of Contract Archeology, University of New Mexico, Albuquerque, NM.
- Keppie, D. M. and C. E. Braun. 2000. Band-tailed Pigeon (*Patagioenas fasciata*). The birds of North America Online (A. Poole, Ed). Ithaca: Cornell Lab of Ornithology. Available online at: <http://bna.birds.cornell.edu/bna/species/>. Accessed September 2009.
- Kuo-wan, L., A. Sanford and I. Tsai. 1997. Probabilistic seismic hazard estimates for New Mexico using instrumental data from 1962 through 1995. Geophysical Open-File Report 84. New Mexico Institute of Mining and Technology, Socorro, NM.
- Langmuir, D. 1997. Aqueous Environmental Geochemistry. Prentice Hall. pp 486-547.
- Laramide Resources (USA), Inc. 2008. Plan of Operations Amendment (Updated October 2008) Prepared for the USDA Forest Service, Cibola National Forest, Mt. Taylor Ranger District. October, 2008.
- Lichvar, R.W. and S. M. McColley. 2003. A field guide to the identification of the ordinary high water mark (OHWM) in the arid west region of the western United States: A delineation manual. U.S. Army Corp of Engineers, ERDC/CRREL TR-08-12
- Lucas, S. G., S. C. Semken, W. R. Berglof, and D. S. Ulmer-Scholle eds. 2003. Geology of the Zuni Plateau. New Mexico Geological Society, Guidebook 54. 425 p.
- Mapel, D. W., D. B. Coultas, and D. S. James et al. 1997. Ethnic differences in the prevalence of nonmalignant respiratory disease among uranium miners, in: American Journal of Public Health, Vol. 87, 1997, No. 5 (May), pp. 833-838.
- McDonald, Brian and Phillip Farah. 1982 "New Mexico Uranium Industry: Current Assessment and Outlook" Albuquerque: Bureau of Business and Economic Research, University of New Mexico, Albuquerque, NM.
- McDonald 1982, p. 17, as cited in Peach and Popp (2008) – McDonald, Brian and Phillip Farah. "New Mexico Uranium Industry: Current Assessment and Outlook" Albuquerque: Bureau of Business and Economic Research, University of New Mexico, 1982.
- McNab, W. H., and P. E. Avers. 1994. Ecological Subregions of the United States: Section Descriptions. USDA Forest Service, Report WO-WSA-5. Washington, DC, USA.

References

- National Land Cover Dataset. 2000. National Land Cover Data. New Mexico. Version 09-10-2000.
- Natural Resource Conservation Service (NRCS). 1998. National Forestry Manual. Title 190. September 1998.
- New Mexico Administrative Code. Available online at: Accessed Online September 19, 2009.
- New Mexico Climate Center. Available online at:
<http://weather.nmsu.edu/data/data.htm>. Accessed September 19, 2009.
- New Mexico Environment Department. 2009. New Mexico Air Quality Control Regions. Available online at: http://www.nmenv.state.nm.us/aqb/modeling/aqcr_map.html#156. Accessed September 9.
- New Mexico Game and Fish Department (NMGFD). 2010. Biota Information System of New Mexico: Cibola County. Available online at:
<http://www.bison-m.org/databasequery.aspx>. Accessed September 2010.
- New Mexico Office of the State Engineer (NMOSE). 2005. Electronic map of declared groundwater basins in New Mexico, online at:
http://www.ose.state.nm.us/PDF/Maps/underground_water.pdf. Accessed October, 2011
- NMOSE. 2009. Unpublished file data, records of permitted water wells. Available online at:
<http://nmwrrs.ose.state.nm.us/WRDispatcher>. Accessed October, 2011
- New Mexico Rare Plant Technical Council [NMRPTC]. 1999. New Mexico Rare Plants. Albuquerque, NM: New Mexico Rare Plants Home Page. Available online at:
<http://nmrareplants.unm.edu>. (Latest update: 22 July 2010).
- NMED, 2009. New Mexico Recommended Area Designations for the 2008 Revised Ozone NAAQS, prepared by the New Mexico Environment Department Air Quality Bureau, released March 11, 2009.
- New Mexico State University (NMSU). 2008. The Economic Impact of Proposed Uranium Mining and Milling Operations in the State of New Mexico James Peach and Anthony V. Popp Office of Policy Analysis Arrowhead Center, Inc. New Mexico State University Las Cruces, NM. August 1, 2008
- National Oceanic and Atmospheric Administration (NOAA). Grants Airport Precipitation Frequency Estimates, 2006. Precipitation-Frequency Atlas of the United States. NOAA Atlas 14, Volume 1, Version 4 National Weather Service, Silver Spring, MD.
- NOAA. WRC. 2009. File data for the National Weather Service San Mateo Station (293234). Available online at: <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?nm3234>.
- Oppelt, Norman "Ted". 2007. Prehistoric Southwest Pottery Types and Wares: Descriptions and Color Illustration. Norman "Ted" Oppelt, Greely, CO.
- Peach, James and Anthony V. Popp. 2008. The Economic Impact of Proposed Uranium Mining and Milling, Operations in the State of New Mexico. Office of Policy Analysis, Arrowhead Center, Inc., New Mexico State University, Las Cruces, NM, August 1.

- Perry F. V., W. S. Baldrige, J. DePaolo, and M. Shafiqullah. 1990. Evolution of a magmatic system during continental extension: the Mount Taylor volcanic field, New Mexico: *Journal of Geophysical Research*, v. 95, pp. 19327-19348.
- Petersen, et al. 2008. Documentation for the 2008 update of the United States National Seismic Hazard maps. Open-File Report 2008-1128. U.S. Geological Survey. p. 60.
- Petersen, R. J. 1980. Geology of pre-Dakota uranium geochemical cell, Sec. 13, T. 16 N., R. 17 W., Church Rock area, McKinley County. In *Geology and mineral technology of the Grants uranium region 1979*. Memoir 38. New Mexico Bureau of Mines & Mineral Resources. pp. 131-138.
- Plumlee, G. S. and M. J. Logsdon eds. 1999. *The Environmental Geochemistry of Mineral Deposits*. Society of Economic Geologists. v. 6A and 6B.
- Quality/level of Service Handbook. 2001. State of Florida Department of Transportation.
- Rudenko, Douglas. 2008. Letter to David Jones, County of Riverside, CA. Blasting Plan and Impact Analysis, Liberty Quarry: Response to Comments, April 23.
- Rautman, C. A. 1980. Geology and mineral technology of the Grants uranium region 1979. New Mexico Bureau of Mines & Mineral Resources, Memoir 38, 400 p.
- Renard, K. G., G. R. Foster, G. A. Weesies, D. K. McCool, and D. C. Yoder. 1997. Predicting soil erosion by water: a guide to conservation planning with the revised universal soil loss equation (RUSLE). U.S. Dept. of Agriculture. Ag. Handbook No. 703. 404 pp.
- Repenning, C. A., J. F. Lance, and J. H. Irwin. 1958. Tertiary Stratigraphy of the Navajo Country. In *Guidebook of the Black Mesa Basin, Northeastern Arizona*, edited by R. Y. Anderson and J. W. Harshbarger, pp. 123–129. Ninth Field Conference, New Mexico Geological Society.
- Santos, E. S. 1970. Stratigraphy of the Morrison Formation and structure of the Ambrosia Lake District, New Mexico. U.S. Geological Survey Bulletin 1272-E. 30 p.
- Shomaker, John & Associates, Inc. 2009a. Technical Memorandum between K. E. Samuels and J. M. Ward regarding Elkins well water quality, May 21.
- Shomaker, John & Associates, Inc. 2009b. Technical Memorandum to J. Mersch Ward regarding evaluation of Elkins well as a supply well for the proposed La Jara Mesa Mine. June 5.
- Smith, D. A., and R. J. Petersen. 1980. Geology and recognition of a relict uranium deposit in Sec. 28, T. 14 N., R. 10 W., southwest Ambrosia Lake area, McKinley County in *Geology and mineral technology of the Grants uranium region 1979*. Memoir 38. New Mexico Bureau of Mines & Mineral Resources. pp. 215-225.
- Snead, J. E. 1995. Landscape, Space, and Community in the Northern Rio Grande, AD 1325–1425. Paper presented at the 60th Annual Meeting of the Society for American Archaeology, Minneapolis, May 3–7.
- Sterling, J. C. 1999. Gray Flycatcher (*Empidonax wrightii*). *The birds of North America Online*, No. 458 in A. Poole and F. Gill, editors. Ithaca: Cornell Lab of Ornithology. Available online at: <http://bna.birds.cornell.edu/bna/species/458>. Accessed September 2009.

References

- Stone, W. J., F. P. Lyford, P. F. Frenzel, N. H. Mizell, and E. T. Padgett. 1983. Hydrogeology and Water Resources of San Juan Basin, New Mexico: New Mexico Bureau of Mines and Mineral Resources Hydrologic Report 6.
- Stuart, David E., and Rory P. Gauthier. 1981. Prehistoric New Mexico, Background for Survey. University of New Mexico Press, Albuquerque, NM.
- Tainter, Joseph A. and David A. Gillio. 1980. Cultural Resource Overview Mt. Taylor Area, New Mexico. For Cibola National Forest, Albuquerque District Bureau of Land Management, Socorro District Bureau of Land Management. USDA Forest Service Southwestern Region, Bureau of Land Management New Mexico State Office Santa Fe, NM.
- Thaden, R. E., E. S. Santos, and E. J. Ostling. 1967a. Geologic Map of the Dos Lomas Quadrangle, Valencia and McKinley Counties, New Mexico: United States Geological Survey, Geologic Quadrangle Map GQ-680.
- U.S. Bureau of Labor Statistics. 2009. Local Area Unemployment Statistics. Available online at: <http://www.bls.gov>. Accessed June 12, 2009.
- U.S. Census Bureau. 2001a. Census 2000 Summary File 1. Available online at: <http://factfinder.census.gov/>. Accessed June 12, 2009.
- U.S. Census Bureau. 2001b. Census 2000 Summary File 3. Available online at <http://factfinder.census.gov/>. Accessed July 14, 2009.
- U.S. Census Bureau. 2008. U.S. Census Bureau, 2008 American Community Survey Population Estimates. Available online at: <http://factfinder.census.gov/>. Accessed June 12, 2009.
- U.S. Department of Agriculture (USDA), Forest Service (USFS). 1974. Guidelines for making soil interpretations. Division of Watershed Mgmt., Rocky Mountain Region. 38 pp.
- USDA USFS. 2000 U.S. Forest Service (Forest Service) Handbook 2209 (August, 2000)
- USDA USFS. Cibola National Forest Land and Resource Management Plan, as amended. USDA, Forest Service, Southwestern Region. Albuquerque, NM, USA. 2010.
- USFS USDA. 2005. Terrestrial Ecological Unit Inventory technical guide. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office, Ecosystem Management Coordination Staff. 245 p.
- USFS USDA. 2006. Cibola National Forest Mt. Taylor Ranger District New Mexico Map. 2003. Revised 2006.
- USFS USDA. 2007. Terrestrial Ecosystem Inventory for the Cibola National Forest.
- USFS USDA. 2008a. Cibola National Forest Mt. Taylor Ranger District Travel Analysis Process for Mt. Taylor Ranger District Travel Management.
- USFS USDA. 2008b. Cibola National Forest, Plan Revision, National Forest Land and Resource Management Plan (LRMP) (1985). Accessed at: <http://www.fs.fed.us/r3/cibola/plan-revision/index.shtml>. Accessed on March 25, 2009.
- USFS USDA. 2011. April, 2011 Decision Notice and Finding of No Significant Impact; Travel Management on the Mt. Taylor Ranger District, Cibola National Forest, Cibola and McKinley Counties, New Mexico.

- U.S. Department of the Interior (USDI) Fish and Wildlife Service (FWS), New Mexico Ecological Services. 2010. Threatened and endangered species: Cibola County. Available online at: <http://www.fws.gov/southwest/es/EndangeredSpecies/lists>. Accessed September 2010
- U.S. Environmental Protection Agency (EPA). 1971. Office of Noise Abatement and Control. Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances. Washington, DC.
- U.S. EPA. 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. Office of Noise Abatement and Control. Washington, DC.
- U.S. EPA, 1994. Technical Document- Background for NEPA Reviewers: Non-Coal Mining Operations, prepared by U.S. EPA, December 1994 (EPA/530/R-95/043)
- U.S. EPA. 2010. Lisa Price, Grants Mining District Coordinator, Assessment of Health and Environmental Impacts of Uranium Mining and Milling; Five Year Plan Grants Mining District, New Mexico; August 2010. Available online at: <http://www.epa.gov/radon/healthrisks.html>.
- U.S. Fish and Wildlife Service (USFWS). 2009. Southwest region ecological services threatened and endangered species list. Available online at: <http://www.fws.gov/southwest/es/EndangeredSpecies/lists>. Accessed August 4, 2009.
- USFWS. 2010. White-Nose Syndrome. Available online at: <http://www.fws.gov/whitenosesyndrome>. Accessed September 2010.
- U.S. Geological Survey (USGS). 1957, 1995, 7.5-minute quadrangle maps, Bluewater, Dos Lomas, San Mateo, Grants, and Lobo Springs.
- Vail, Scott. 2009. New Mexico Environment Department Air Quality Bureau. Phone conversation regarding fugitive dust regulations, NSPS and back-up generator permitting requirements. September 21.
- Vehicle Occupancy. 1981. U.S. Department of Transportation, Office of Highway Planning. April.
- Wanty, R. B., W. R. Miller, P. H. Briggs, and J. B. McHugh. 1999. The Environmental Geochemistry of Mineral Deposits. in Plumlee, G. S. and M. J. Logsdon, eds. Part A. Processes, Techniques and Health Issues. Society of Economic Geologists. Reviews in Economic Geology, v.6A. pp. 201-214.
- Western Regional Air Partnership (WRAP) and Area Source Emissions Projections for the 2018 Base Case Inventory, Version 1, prepared by Eastern Research Group, Inc. January 25, 2006.
- White, W. D. and T. E. Kelly. 1989. The San Andres-Glorieta aquifer in west-central New Mexico. New Mexico Geological Society. Guidebook 40. pp. 331-335.
- Williams, Jerry, L. 1986. New Mexico in Maps. Technology Application Center. University of New Mexico, Albuquerque, NM.

References

- Zamora, C. 2009a. Management Indicator Species Assessment for the Implementation of the La Jara Mesa Uranium Mining Project. Mt. Taylor Ranger District, Cibola National Forest, Cibola County, NM.
- Zamora, C. 2009b. High priority migratory bird report: The implementation of the La Jara Mesa uranium mining project. Mt. Taylor Ranger District, Cibola National Forest, Cibola County, NM.
- Zamora, C. 2010. Personal communication between Ecosystem Management, Inc. and the Mt. Taylor Ranger District wildlife biologist regarding noxious weeds. February 4.

Appendix A. Ore Transport Policy

Transportation Policy for Shipments of Colorado Plateau Uranium Ores to the White Mesa Uranium Mill

Purpose:

The purpose of this policy is to describe the shipping responsibilities and practices to be employed when shipping uranium ore from a Colorado Plateau mine (the "Mine") by truck to the White Mesa Uranium Mill (the "Mill"). The policy outlines specific shipping precautions and necessary documentation to maintain compliance with applicable requirements of the U.S. Department of Transportation ("DOT") regulations at Title 49 of the Code of Federal Regulations. Safe transportation of uranium ore from the Mine to the Mill is paramount to Denison Mines (USA) Corp. ("DUSA"), and strict adherence to this policy is required.

Scope:

This policy encompasses uranium ore shipping and transportation requirements and the specific responsibilities of the Mine operator/owner, the transport contractor (the "Transportation Contractor") and Mill personnel with regard to: maintaining exclusive use shipments, personnel training, vehicle marking, preparation of shipping papers, transportation requirements, emergency response, radiation control, record retention and other matters.

Policy

1. Summary of Responsibilities

1.1. Mine Operator/Owner Responsibilities

The Mine operator/owner will be responsible for:

- Providing training to Mine operator/owner and/or Transportation Contractor personnel relating to the appropriate safe handling practices specific to uranium ores during loading, transport and unloading operations (see Section 3.1.2).
- Ensuring that the required shipping papers are completed, signed, and delivered to the transport driver (see Section 5).
- Verifying that ore shipments from the Mine are not A₂ quantities of Class 7 radioactive material and hence not subject to certain marking and labeling requirements (see Section 2).
- Ensuring that gamma and removable contamination limits for ore shipments from the Mine are satisfied (see Sections 8.2 and 8.3).

1.2. Transportation Contractor Responsibilities

Transportation contractor personnel will be responsible for:

- Providing appropriate vehicle markings (see Section 4).

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- Transporting uranium ore to the Mill in accordance with Section 6 below.
- Unloading transported uranium ore at the Mill.
- Maintaining exclusive (sole) use of the transport vehicle for uranium ore shipment and providing a closed conveyance trailer while shipping uranium ore to the Mill (see Sections 2 and 6.1).
- Carrying and delivering to the Mill a copy of the shipping papers which will accompany the uranium ore shipment (see Section 5).
- Ensuring that the training requirements described in Section 3.1.1 are satisfied.
- Preparing and adhering to an Emergency Response Plan (see Section 7).
- Contacting DUSA personnel listed on the shipping documents and providing emergency response and cleanup personnel should accidental spillage of uranium ore occur during transport to the Mill (see Section 7).
- Requesting an unrestricted use release survey from Mill radiation safety personnel when the transport vehicle is planned for uses other than uranium ore haulage (see Section 8.3.2).

1.3. DUSA Responsibilities

DUSA personnel will be responsible for:

- Assisting in emergency response situations if accidental spillage of uranium ore during transport has occurred (see Section 7).
- Completing radiation surveys of the transport vehicles prior to return to service for unrestricted use and shipment of commodities other than uranium ore (see Section 8).
- Signing and retaining all shipping and survey records pertaining to shipments of uranium ore (see Sections 5 and 9).

2. **Classification of Ore and Exclusive Use Shipments**

The Colorado Plateau uranium ore that will be shipped from the Mine to the Mill is classified as Class 7 Radioactive LSA-I "hazardous material" under 49 CFR 171.8. However, shipments of 32 tons or less per trailer will generally not constitute an A₂ quantity of any Class 7 radioactive material, within the meaning of 49 CFR 173.403, due to the relatively low specific activity of the uranium ore. This means that the shipments will generally be exempt from most of the marking and labeling requirements (see Section 2(e)). It is the responsibility of the Mine operator/owner to ensure that ore shipments from the Mine are not A₂ quantities of Class 7 radioactive material. An A₂ quantity means that the activity from Unat or from any of its daughters in any ore shipment exceeds the activity level set out in the table in 49 CFR 173.435.

Although the Colorado Plateau uranium ore will generally not on average have a high enough specific activity level to constitute a "hazardous substance" under 49 CFR 171.8, DUSA has concluded that it is nevertheless prudent that shipping papers and an emergency response plan, normally required only for shipments of hazardous substances under 49 CFR 177.200, 177.817 and 172.600, be required for each load of uranium ore (see Sections 5 and 7 below).

The uranium ore will be consigned as exclusive use shipments of uranium ore in accordance with the provisions of 49 CFR 173.427(a)(6) and will be shipped unpackaged in accordance with the provisions of 49 CFR 173.427(c). Accordingly,

- a) Shipments must be loaded by the Mine operator/owner or the Transportation Contractor at the Mine and unloaded by the Transportation Contractor at the Mill, in accordance with directions from Mill personnel, from the truck trailer in which it was originally loaded;
- b) The Transportation Contractor must ensure that there is not any leakage of uranium ore from the truck trailer;
- c) Specific instructions for maintenance of exclusive use shipment controls will be provided by the Mine operator/owner to the Transportation Contractor with the shipping paper information (see Section 5.2 below);
- d) Because the shipments will be of uranium ore, the transport vehicle is not required to be placarded (see 49 CFR 173.427(a)(6)(v)); and
- e) Because shipments of Colorado Plateau uranium ores of 32 tons or less will generally contain less than an A₂ quantity of any Class 7 Radioactive material, the shipments are generally exempted from the marking and labeling requirements set out in 49 CFR 172 Subparts D and E (see 49 CFR 173.427(a)(6)(vi)), provided that the trailers are marked "RADIOACTIVE-LSA" in accordance with Section 4(a) below. It is the responsibility of the Mine operator/owner to ensure that each shipment of ore from the Mine contains less than an A₂ quantity of any Class 7 radioactive material.

3. Training Requirements

3.1. Shipment Personnel

3.1.1. *Training Required to be Provided by the Transportation Contractor*

In accordance with the requirements of 49 CFR 177.800 and 177.816, each truck driver and any other Transportation Contractor personnel involved in the loading or unloading of uranium ore onto and from the uranium ore truck must be trained in the applicable requirements of 49 CFR parts 390 through 397 and the procedures necessary for the safe operation of the vehicle. Driver training must include the following subjects:

- a) Pre-trip safety inspection;
- b) Use of vehicle controls and equipment, including operation of emergency equipment;
- c) Operation of vehicle, including turning, backing, braking, parking, handling, and vehicle characteristics including those that affect vehicle stability, such as effects of braking and curves, effects of speed on vehicle control, dangers associated with maneuvering through

curves, dangers associated with weather or road conditions that a driver may experience (e.g., blizzards mountainous terrain, high winds), and high center of gravity;

- d) Procedures for maneuvering tunnels, bridges, and railroad crossings;
- e) Requirements pertaining to attendance of vehicles, parking, smoking, routing, and incident reporting; and loading and unloading of materials.

This training is the responsibility of the Transportation Contractor and may be satisfied by compliance with the current requirements of a Commercial Driver's License with a hazardous materials endorsement.

3.1.2. Additional Training to be Given by the Mine Operator/Owner

It is the responsibility of the Mine operator/owner to ensure that Mine operator/owner and Transportation Contractor personnel involved in loading, transporting and unloading the consigned uranium ore shipment also receive additional specialized training relating to the appropriate safe handling practices specific to uranium ore shipments. A training record will be documented by the Mine operator/owner.

This training should include at a minimum the following radiation safety topics:

- a) basic radiation concepts (alpha, beta and gamma radiation);
- b) dust and contamination control measures necessary during loading, unloading and uranium ore shipment:
 - avoid inhalation during loading and unloading operations
 - tarpaulin covers and tailgate closure requirements (i.e. closed transport vehicle)
 - avoid spillage onto the vehicle during loading operations
 - avoid shipment during muddy mine site conditions;
- c) vehicle survey requirements to release vehicles for unrestricted use;
- d) exclusive use transport provisions; and
- e) emergency response contact information in the event of accidental uranium ore spillage during transport (who should be contacted at DUSA and what information should be conveyed).

4. Vehicle Marking

Each exclusive use transport conveyance (trailer) shall be marked as follows:

- a) The words "RADIOACTIVE LSA" must be stenciled or otherwise affixed to the surface or on a label, tag or sign in 3 inch letters in a conspicuous place on both sides of the trailer (see Section 2(e) above); and
- b) The words "FOR RADIOACTIVE MATERIALS USE ONLY" must be stenciled in 3 inch letters in a conspicuous place on both sides of the trailer (see Section 8.3.1(b) below).

Such markings must remain affixed to the trailer during the entire period of exclusive use, regardless of whether the vehicle is loaded with uranium ore or not. These markings can be removed from the transport trailer only after the vehicle has been surveyed for unrestricted release at the Mill, at which time the vehicle is free to ship commodities other than uranium ore. **VEHICLES SHALL NOT BE USED FOR THE SHIPMENT OF ANY OTHER MATERIALS UNLESS THEY HAVE BEEN SURVEYED FOR UNRESTRICTED RELEASE BY MILL RADIATION SAFETY STAFF.** Upon release of any vehicles for unrestricted use in accordance with the provisions of Section 8.3.2 below, Mill staff will remove or paint over such markings. However, prior to re-use for transporting uranium ore to the Mill, such markings must be re-affixed to the trailer by the Transportation Contractor.

5. Shipping Papers

5.1. Material Description & Shipment Information

Each uranium ore shipment must be accompanied with signed shipping papers that comply with the requirements of 49 CFR Part 172, and shall include, in the case of uranium ore from Colorado Plateau mines, the following information:

Exclusive Use Shipment

Date of Acceptance:	_____
Shipping Name:	Radioactive Material-LSA 1 (<i>non-fissile</i>)
Hazard Class:	Class 7
Identification Number:	UN 2912
Packaging:	Bulk-Unpackaged
Quantity:	_____ TBq (0.30 Ci)
Radionuclide(s):	U-Nat. and associated decay chain progeny
Form:	Solid (Unrefined Uranium Ore)
Transport Index:	_____
Emergency Response	
Telephone Number:	_____

The shipping papers will be prepared by the Mine owner or operator. The Transportation Contractor shall ensure that the shipping papers are readily available to, and recognizable by, authorities in the event of an accident or inspection, in accordance with the requirements of 49 CFR 177.817(e).

5.2. Exclusive Use Statement

The following exclusive use statement must be printed onto the shipping papers:

This shipment of uranium ore is being shipped as an exclusive (sole) use shipment. Accordingly, the contents of this shipment must be loaded at the Mine and unloaded at the White Mesa Mill, absent any unloading or additional loading prior to delivery at the Mill. The transportation conveyance trailer must be utilized only for uranium ore transport until such time that Mill personnel conduct a survey of the interior and exterior of the trailer and determine that the trailer can be released for unrestricted use. At such time that the trailer is released for unrestricted use, all markings related to the radioactive material shipment must be removed from the conveyance trailer.

5.3. Certification

The Mine owner or operator shall certify that the uranium ore is offered for transportation in accordance with the applicable DOT regulations by printing the following certification on the shipping papers:

This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

This certification must be legibly signed by an employee of the Mine operator or owner.

6. Transportation Requirements

6.1. Vehicles to be Kept Closed at all Times

The trailers must be kept closed at all times, when containing uranium ore and when empty, by use of a tarpaulin or other suitable mechanism, other than loading and unloading (see Section 8.3.1(c) below).

6.2. Transportation Route

The Transportation Contractor shall advise DUSA of the route to be taken from the Mine to the Mill. It should be noted, however, that shipments of uranium ore are not a "highway route controlled quantity" within the meaning of 49 CFR 403 and the applicable provisions of Title 49.

6.3. No Unnecessary Delay in Movement of Shipments

As required by 49 CFR 177.800, all shipments of uranium ore to the Mill must be transported without unnecessary delay, from and including the time of commencement of loading of the uranium ore until its final unloading at the Mill.

6.4. Use of Safe Havens

If necessary in order to coordinate delivery times at the Mill, the Transportation Contractor may designate suitable safe havens for the temporary storage of transportation vehicles along the transportation route from the Mine to the Mill. The location and use of such safe havens will be subject to the approval of DUSA.

7. **Emergency Response**

Emergency response in the event of an accident resulting in the spillage of uranium ore (or other spillage during transport) is the contractual responsibility of the Transportation Contractor. DUSA's role in such incidents will be to provide technical support, if required, during the emergency situation and, if necessary, to verify that cleanup requirements have been met. In addition, DUSA must be contacted, at the telephone number listed on the Shipping Papers, as immediately as possible in order to coordinate any necessary reporting to regulatory agencies.

The Transportation Contractor shall prepare an Emergency Response Plan for transportation of the uranium ore to the Mill, in accordance with 49 CFR 172 Subpart G, and shall provide a copy of such plan to DUSA for review and approval.

It should be noted that typical uranium grades for Colorado Plateau uranium ores (0.25-0.30% U_3O_8) do not represent a "Reportable Quantity". As such, reporting of spills to the National Response Center is not generally required. However, the National Response Center must be notified as soon as practical but no later than 12 hours after the occurrence of an incident listed in 49 CFR 171.15, such as where the general public is evacuated for one hour or more; a major transportation artery or facility is closed or shut down for one hour or more or suspected radioactive contamination occurs. In addition, a written report must be filed by the Transportation Contractor in accordance with 49 CFR 171.16. These notification requirements, including contact information, shall be included in the Transportation Contractor's Emergency Response Plan.

8. **Radiation Control**

8.1. Gamma Radiation Survey (Transportation Index)

Based upon a typical uranium ore grade of 0.25-0.30 % U_3O_8 for Colorado Plateau uranium ores, the gamma exposure rate from the transport vehicle is expected to be less than 1 mrem/hr. As a result, the requirements of 49 CFR 173.427(a)(1) that the external dose rate may not exceed an external radiation level of 1,000 mrem/hr at 3 meters from the unshielded material, and the requirements of 49 CFR 173.427(a)(5) and 173.441 (a) that under conditions normally incident to transportation:

- the radiation level does not exceed 200 mrem/hr at any point on the external surface of the package; and
- the transport index does not exceed 10,

are expected to be satisfied in all cases. It is also expected that the average reading in the occupied space of each truck cab will not exceed the DOT limit of 2 mrem/hr, specified in 49 CFR 173.441(b)(4).

8.2. Gamma Radiation Survey (Transportation Index)

It is the responsibility of the Mine operator/owner to ensure that the radiation levels fall within the applicable limits summarized in Section 8.1 above. At a minimum, the Mine operator/owner will perform the following surveys at the Mine site on a representative number of uranium ore shipments from the Mine:

- a) A beta/gamma survey will be conducted at various locations on all sides of the transport vehicle to determine if the radiation level exceeds 200 mrem/hr at any point on the external surface of the vehicle;
- b) A gamma survey will be conducted at one meter from all sides of the transport trailer. The average reading in mrem/hr will be recorded as the Transport Index for all uranium ore shipments from the Mine; and
- c) A gamma survey will be conducted within the cab of the transport tractor. The average reading in mrem/hr will be recorded to verify that the occupied space will not exceed the 2 mrem/hr limit.

These surveys will be recorded and kept on file.

In addition, the Mine operator/owner will perform (and document for the record) spot gamma surveys on uranium ore shipments from time to time as it deems appropriate in order to ensure that the regulatory standards are satisfied.

8.3. Removable Contamination Surveys

8.3.1. Vehicles Used Solely for Purposes of Transporting Ore from the Mine to the Mill.

49 CFR 177.843 provides that routine surface contamination surveys are not required at the Mine site or at the Mill for any vehicle used solely for transporting bulk-unpackaged uranium ore from the Mine to the Mill provided that:

- a) a survey of the interior surface of the conveyance trailer (when empty) shows that the radiation dose rate does not exceed 10 mrem/hr on contact or 2 mrem/hr at 1 meter from the interior surface. Since the conveyance, when filled with uranium ore is not expected to exceed 2mrem/hr on contact, a surveyed dose rate from the interior surface (or any other point on an empty trailer) should not exceed these limitations;
- b) the vehicles are stenciled with the words "FOR RADIOACTIVE MATERIALS USE ONLY" as described under Section 4(b) above; and

- c) the vehicles must be kept closed (such as through the use of a tarpaulin) at all times other than loading and unloading.

In order to verify that the radiation dose rate of the empty vehicles will not exceed the limits set forth in paragraph (a) above, and routine surveys to demonstrate compliance with this limit are not warranted, Mill Radiation Staff will verify (and document for the record) that this is the case by surveying a representative number of the initial vehicles as they are released from the Mill for return to the Mine. In performing such surveys, Mill Radiation Staff will follow existing Mill standard operating procedures.

It should be noted that, in order for vehicles to be released from the Mill site, Mill staff will also be required to survey the vehicles in accordance with the requirements of Nuclear Regulatory Commission Regulatory Guide 1.86 ("Reg. Guide 1.86"), unless and to the extent exempted by the Utah Division of Radiation Control. Reg. Guide 1.86 does not apply to releases of vehicles from the Mine site.

Unless the Transportation Contractor advises Mill staff otherwise, Mill staff will assume that each vehicle released from the Mill site will be returning to use solely for transporting uranium ore from the Mine to the Mill, and will not be released for unrestricted use.

The Transportation Contractor will advise Mill staff prior to sending any vehicle in for repairs or servicing, so that Mill staff can ensure that the vehicle to be serviced or repaired has been released for unrestricted use. No vehicle may be sent in for servicing or repair unless it has been released for unrestricted use by Mill staff.

8.3.2. Vehicles That Will Not be Used Solely for Transporting Ore From the Mine to the Mill (Free Release)

49 CFR 177.843 provides that each motor vehicle used for transporting uranium ores under exclusive use conditions in accordance with 49 CFR 173.427(c) must be surveyed with radiation detection instruments after each use. A vehicle may not be returned to service (i.e., released from the Mill for unrestricted release) until the radiation dose rate at every accessible surface is 0.5 mrem/hr or less and the removable (non-fixed) radioactive surface contamination is not greater than 2,200 dpm/100 cm², as required under 49 CFR 173.443(a).

As a result, if the Transportation Contractor advises Mill personnel that any particular vehicle will not be returning for use solely for purposes of transporting uranium ore from the Mine to the Mill or is to be sent in for servicing or repairs, Mill Radiation Safety staff will survey the vehicle prior to releasing it from the Mill site to ensure that it satisfies these criteria, as well as the applicable provisions of Reg. Guide 1.86. In performing such surveys, Mill Radiation Staff will follow existing Mill standard operating procedures.

Once a vehicle is surveyed for unrestricted release in accordance with this Section, Mill staff will remove or paint over the markings on the vehicle, described in Section 4 above.

9. Records

Records of all shipments will be maintained at the Mill office for at least 375 days or such longer period of time as may be required by applicable regulations.

10. Compliance With Laws

It is the responsibility of the Transportation Contractor to comply with all other applicable laws and regulations relating to the transportation of uranium ore from the Mine to the Mill that are not specifically mentioned in this procedure.

July 5, 2007

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Appendix B. Suggested Mitigation

Vegetation

- Hand pulling, digging, mechanical methods, and/or application of appropriate herbicide/biological control would be used for weed control, including hand pulling, hand digging, and biological control to prevent and restrict the spread of noxious weeds.
- Seeded areas away from the site footprint would be monitored up to 2 years or until the vegetation cover meets Forest Service standards.
- A washdown of vehicles entering the area from other job locations would be implemented to reduce the introduction of noxious weeds to the site.
- Control measures including hand pulling, hand digging, and biological control would be used to prevent and restrict the spread of noxious weeds.
- Certified noxious weed-free mulch and seed mixtures would be used to reclaim disturbed areas and control the spread of invasive and noxious weeds.

Wildlife

The New Mexico Department of Game and Fish (NMDGF) has provided mitigation measures for drilling and mining activities in letters addressed to the Forest Service on similar mining projects. The mitigation measures include the following:

- If used, above ground tanks should also be covered, netted, or provided with effective means of escape.
- Avoid vegetation removal during the gray vireo breeding season if present (April 1 to July 31).
- To avoid raptor electrocution, power lines should be designed with adequate separation of energized hardware or insulation of wires. Adequate separation may be achieved by enlarging the physical dimensions of the pole, cross arm, or ground wire spacing hardware.
- Consider the Powerline Project Guidelines published by the New Mexico Department of Game and Fish (NMDFG, 2007), which include recommendations such as those listed below:
 - Avoid the use of grounded steel cross-arm braces.
 - Closely spaced transformer jumper wires, bushing covers, protective cutouts, or surge arresters can be made safe for raptors by the use of special insulating material.
 - Fence construction should follow current NMDGF fencing guidelines (NMDFG, 2003) for the preferred 3-strand fence for big game habitat.
 - Surveys for gray vireo could be done to determine the presence of gray vireo and vegetation clearing limited to April 1 to July 31 if present; or their presence could be assumed and the clearing construction window avoided.
 - NMDGF recommends conducting a raptor nesting survey within half a mile of the project area and resurveying for nesting activity prior to construction.

- To protect elk and mule deer, NMDGF recommends the following:
 - Construction and mining personnel should be prohibited from possessing firearms and pets while onsite.
 - If feasible, limit access to the project area to authorized personnel only by an automated keypad or similar safety precautions.
 - Implement shift changes at 4 p.m. to maximize traffic volume during daylight hours year round to reduce chances for road kill.
 - Strictly enforce the 35 mph speed limit.
 - Consider the use of motion detector warning devices to detect animals approaching the access roads, particularly the easternmost portion of the access route.
 - Consider using the proposed access route from Highway 605 through the Elkins property to reduce the travel length.
 - Consider no construction activities during the breeding season.

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